GIS & its Applications in Administration

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- Concepts of GIS
- Overview of Bhuvan
- GIS Application in Administration
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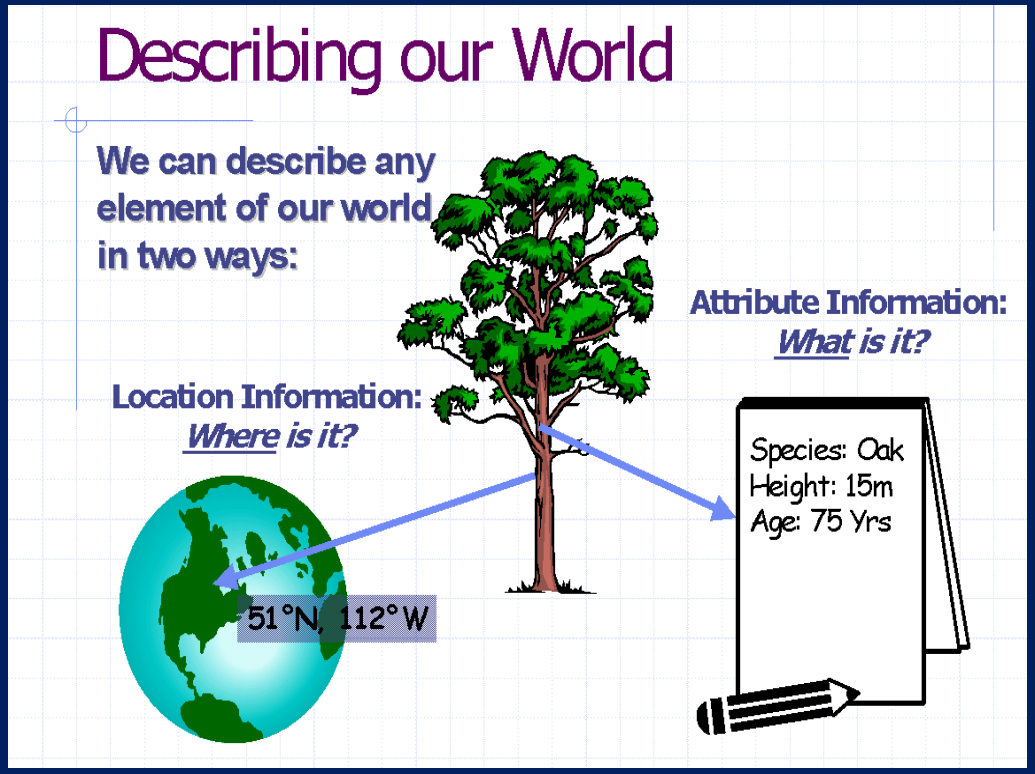
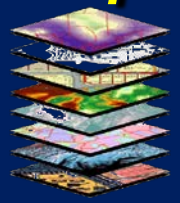
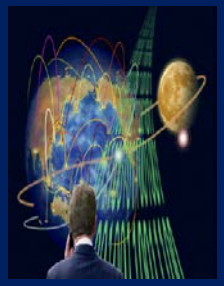
Geospatial Data

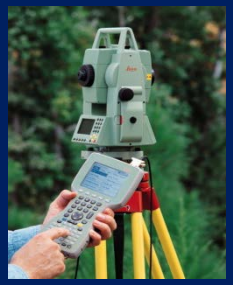
- "Geographically referenced data that describe both the location (geometry) and the characteristics of spatial features."

(Chang, 2009)



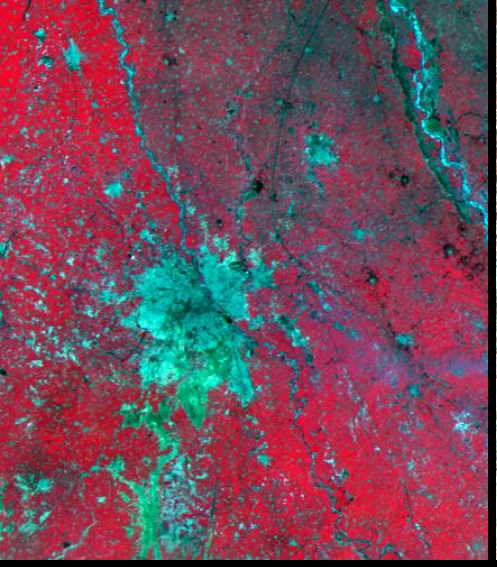
Convergence of Geospatial Technologies

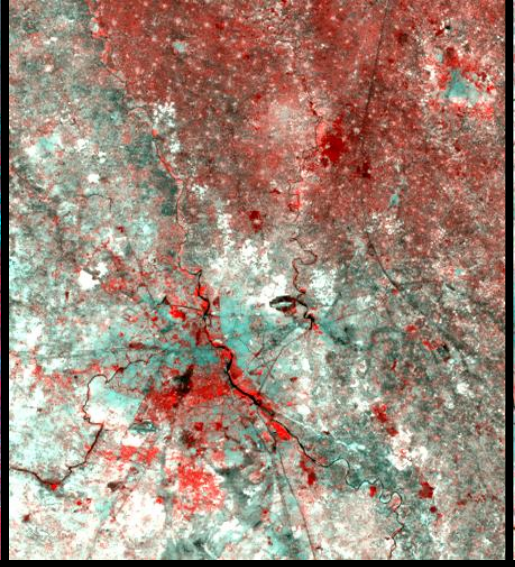


GIS
RS
ICT
GPS
LBS
Band width
Photo-grammetry
Convergence
ALTM
Total Station
Total Turnkey Solutions

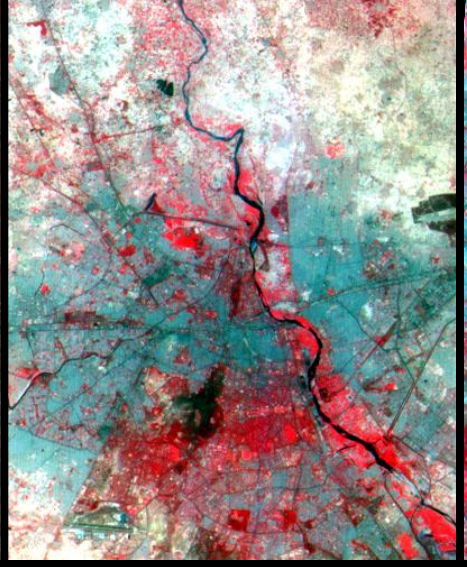
...cutting edge technologies



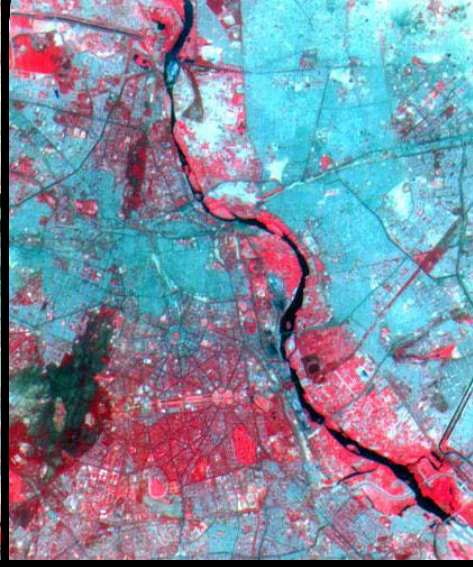
IRS – OCM 360 meters



IRS – WIFS 188 meters



IRS – LISS-I 76 meters



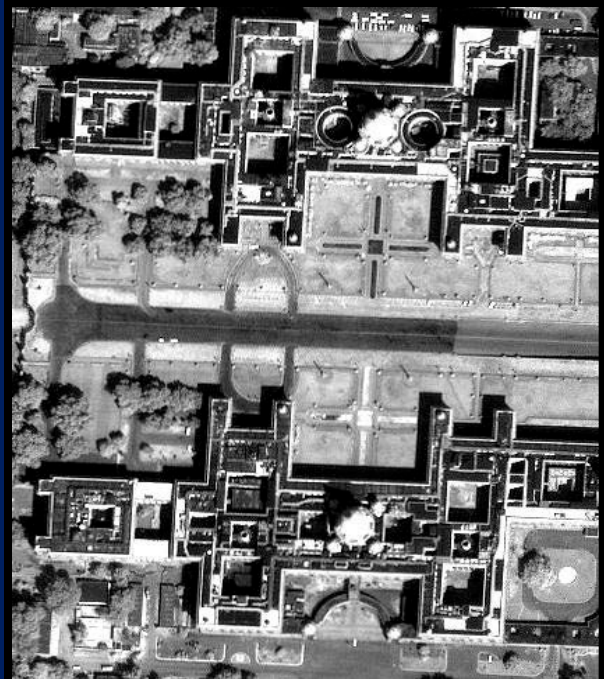
IRS – LISS-II 36 meters

IMPROVEMENTS IN SPATIAL AND SPECTRAL RESOLUTIONS OF SENSORS DELHI AND ENVIRONS

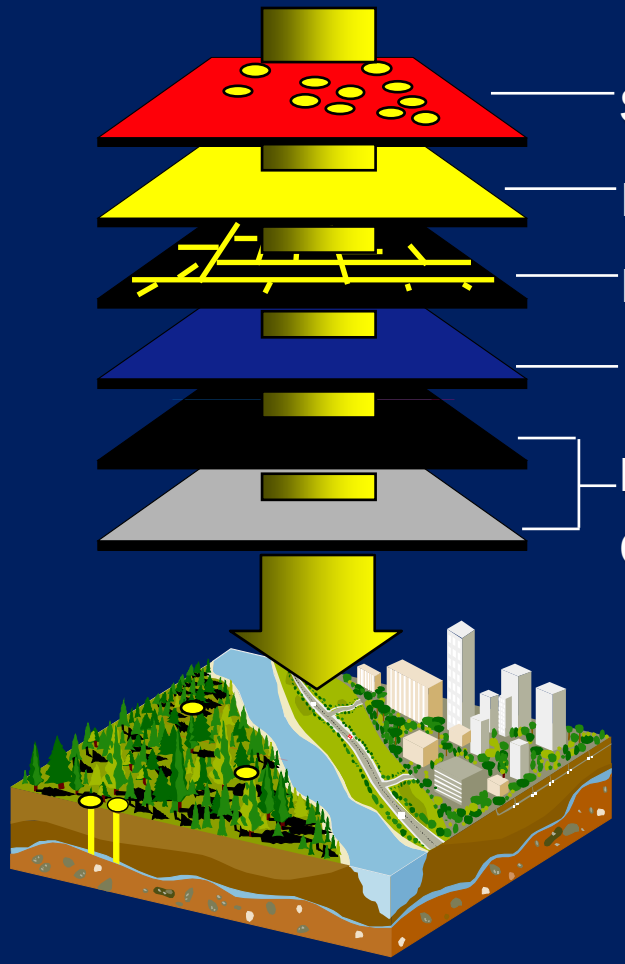
IRS – LISS-III 23 meters

IRS – PAN 5 meters

CARTOSAT 2 < 1 meter



What is GIS…….



"A Geographic Information System is a collection of tools to build, maintain, and use electronic maps and associated databases"

… A tool that makes complex things easier to understand and manage

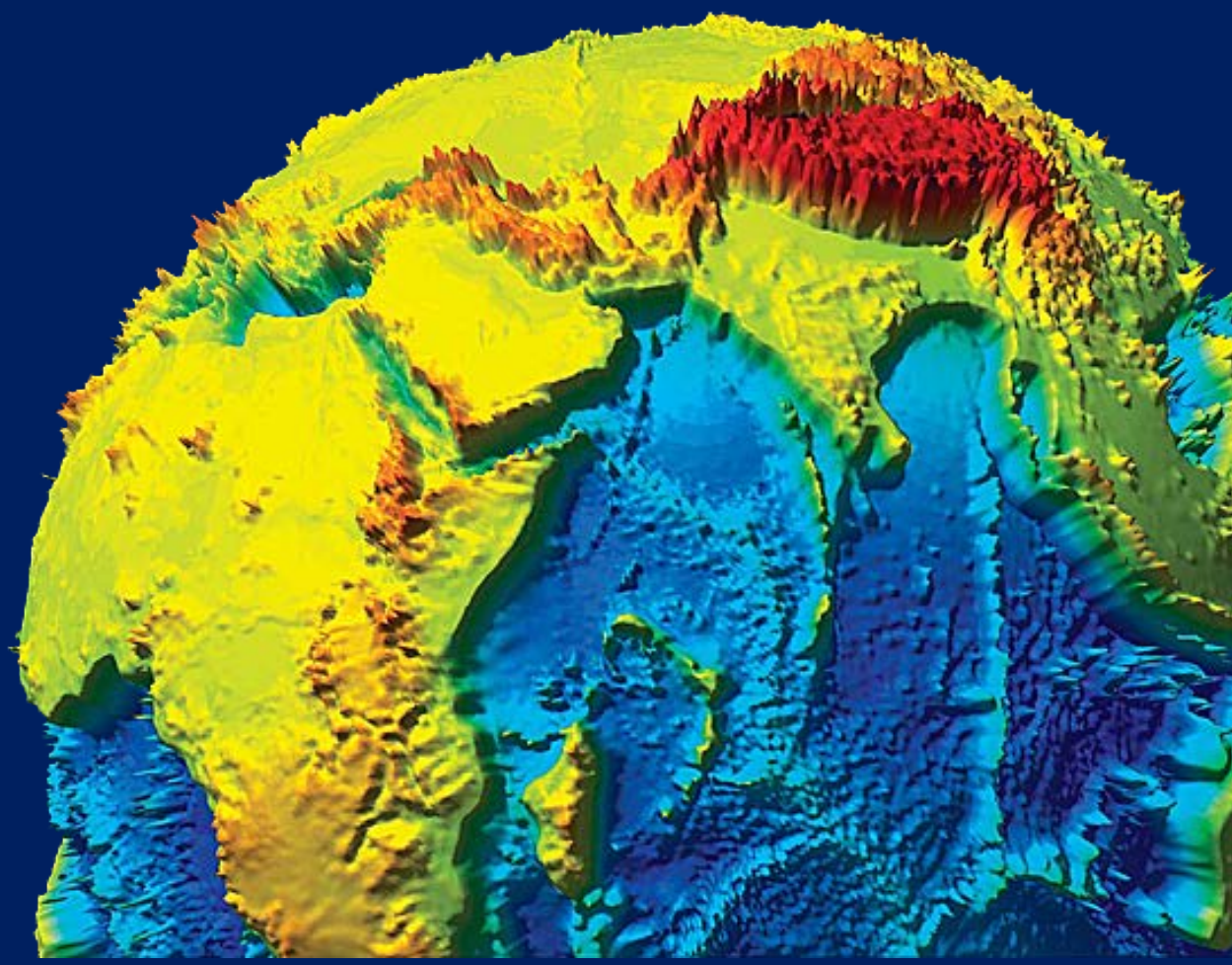
GIS is the Science of Our Environment

…the new language to describe our environment

Increasingly Being Seen as a Framework for

- Understanding
  - Patterns
  - Relationships
  - Processes
- Conceptualizing
- Modeling
- Visualizing

. . . Integrating
What We Know

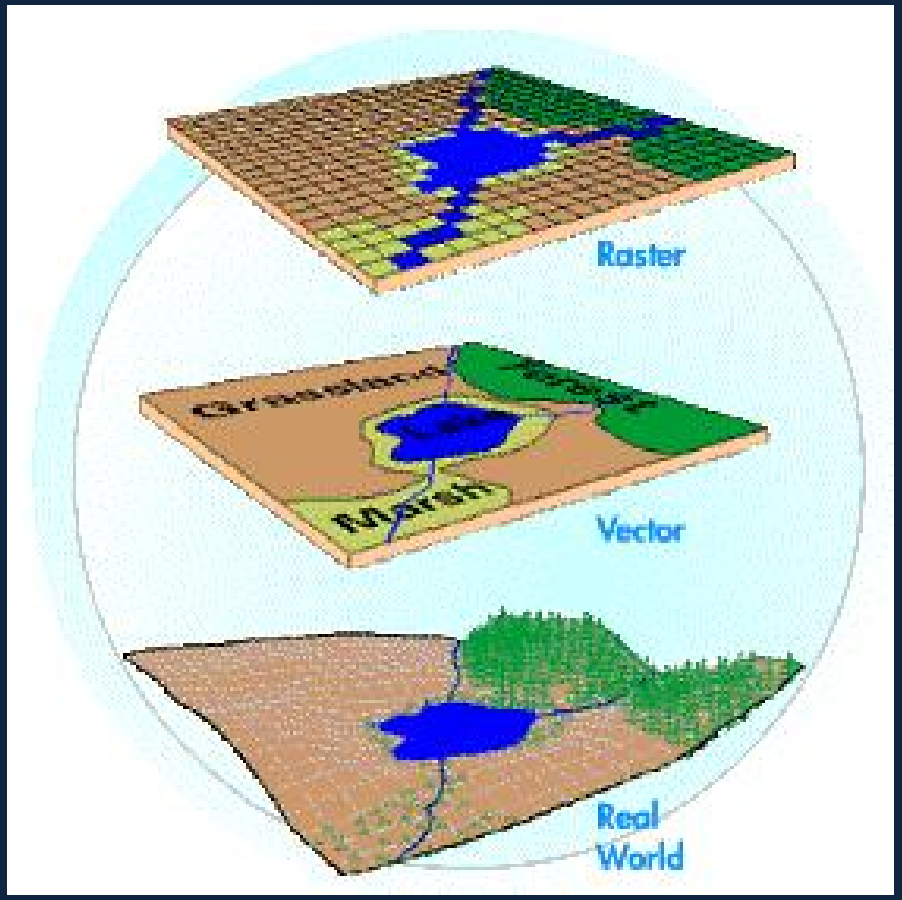


Spatial data models

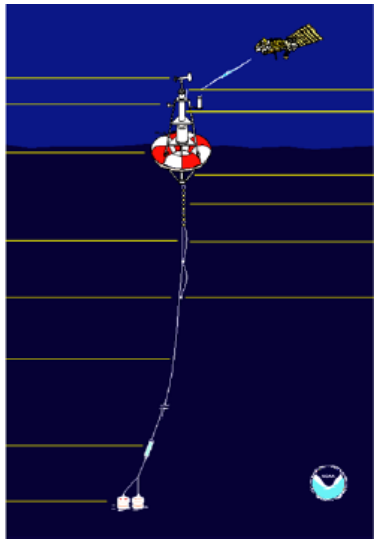
- Two fundamental approaches:

  –raster model

  –vector model



Functionalities of GIS

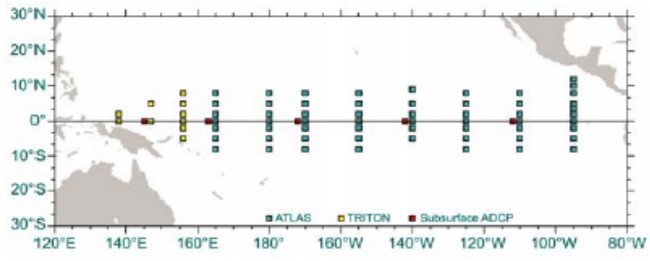


Data Capture

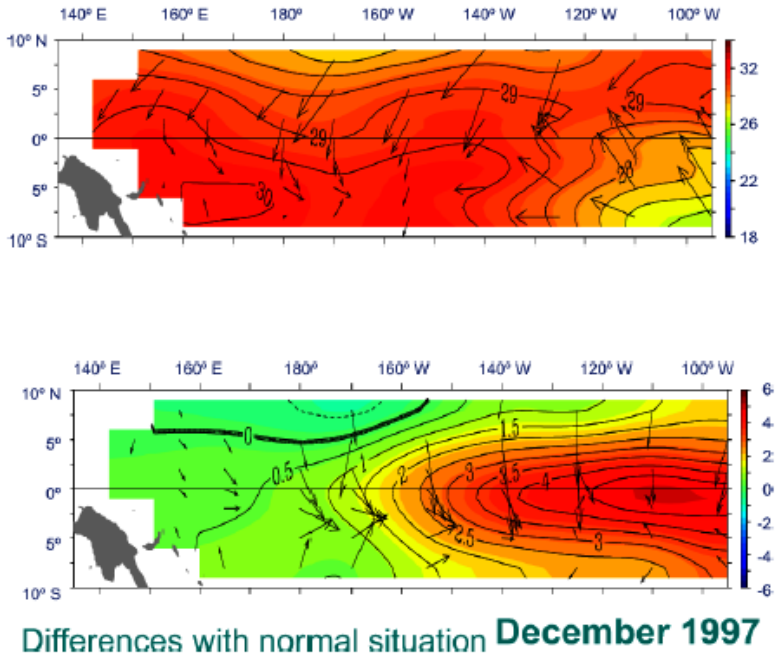
DAYMEASUREMENTS

Buoy	Date	SST	WS	Humid	Temp10	...
B0749	1997/12/03	28.2° C	NNW 4.2	72%	22.2°	...
B9204	1997/12/03	26.5° C	NW 4.6	63%	20.8°	...
B1686	1997/12/03	27.8° C	NNW 3.8	78%	22.8°	...
B0988	1997/12/03	27.4° C	N 1.6	82%	23.8°	...
B3821	1997/12/03	27.5° C	W 3.2	51%	20.8°	...
B6202	1997/12/03	26.5° C	SW 4.3	67%	20.5°	...
B1536	1997/12/03	27.7° C	SSW 4.8	58%	21.4°	...
B0138	1997/12/03	26.2° C	W 1.9	62%	21.8°	...
B6823	1997/12/03	23.2° C	S 3.6	61%	22.2°	...
...	...	...	...	...	...	...

Data Management



Data Analysis & Presentation



Source:
ITC Text Book of GIS

Data Manipulation

Buoy	Geographic position	Dec. 1997 avg. SST
B0789	(165° E, 5° N)	28.02° C
B7504	(180°, 0°)	27.34° C
B1882	(110° W, 7°30′ S)	25.28° C
...	...	...

GIS-based Analysis

Questions a GIS can Answer?

- ☆ LOCATION (Question: What is at ...?)
- ☆ CONDITION (Question: Where is it....?)
- ☆ TRENDS (Question: What has changed since....?)
- ☆ PATTERN (Question: What spatial pattern exists..?)
- ☆ MODELING (Question: What if....?)

Geospatial Analysis

Why?

Answer geographic questions

- *Where is the nearest school to my home?*

Make informed decisions

- *Choosing where to locate a new refinery*

Take action, make changes

- *Change an intended hiking route*

Build accurate models

- *Modeling effects of change of LULC on soil erosion*

Methods?

- SIMPLE QUERY
- SPATIAL QUERY
- SINGLE LAYER OPERATION
- MULTIPLE- LAYER OPERATIONS
- SURFACE ANALYSIS
- NETWORK ANALYSIS
- POINT PATTERN ANALYSIS
- SPATIAL MODELING

BHUVAN - Geoplatform

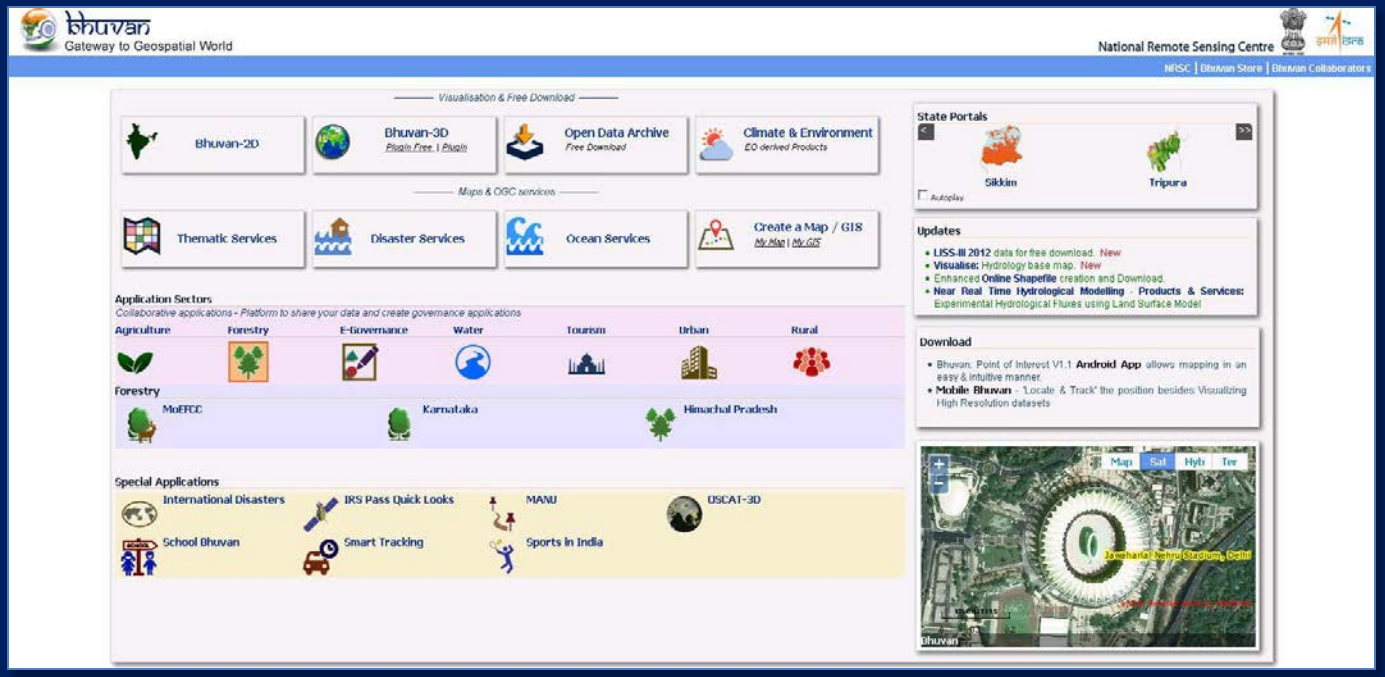
Visualization (18 TB) and Free Download (100 GB)

Maps & OGC Services (~1000+)

Applications (64)

State Portals (30)

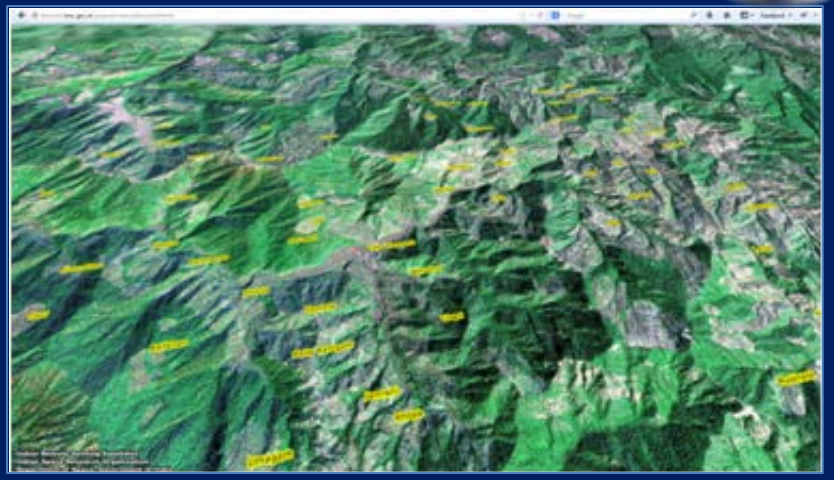
Crowd Sourcing (3.7 M)

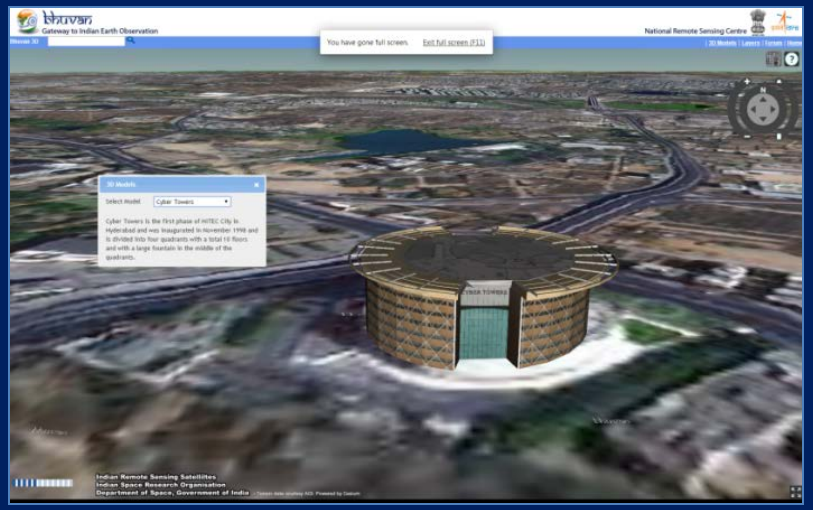


- 55 K Registered Users
- 1 M unique visitors
- 125 K Subscribers
- 400 K free download

http://bhuvan.nrsc.gov.in

Visualization



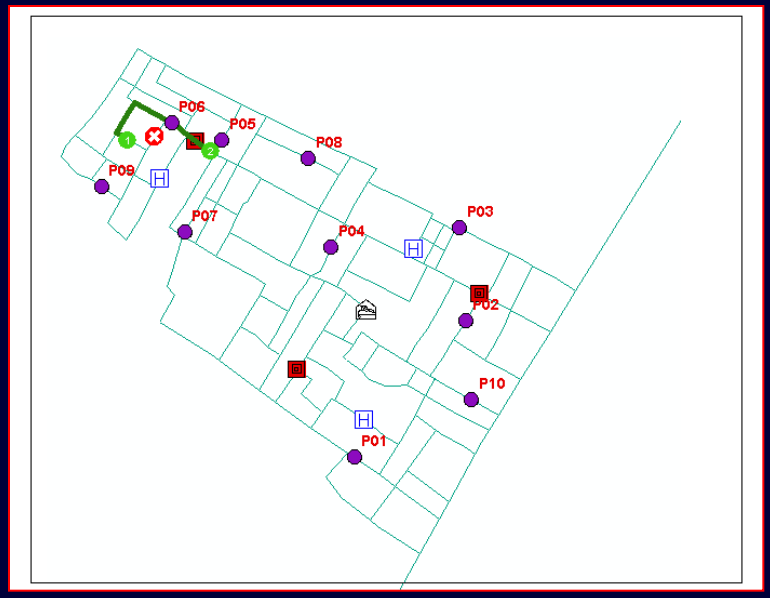


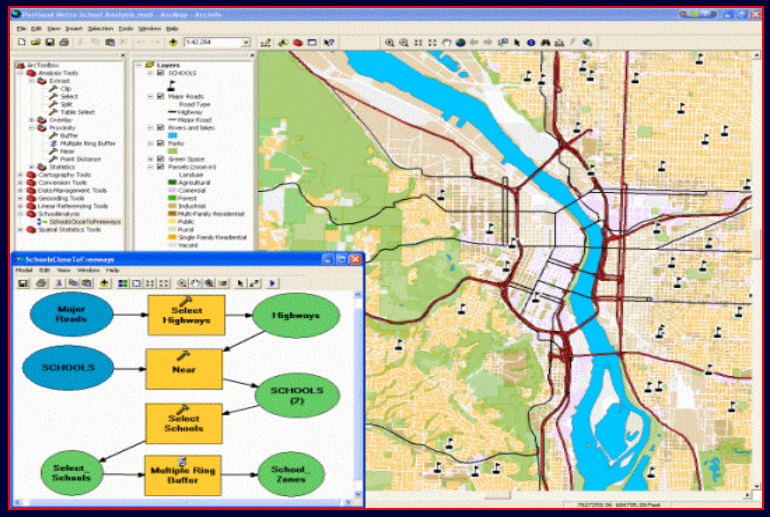
"2009 : - Plugin required, Best viewed on IE 8 and 2014 :- platform & plug-in independent"

GIS Applications in Administration

GIS for Managing Elections

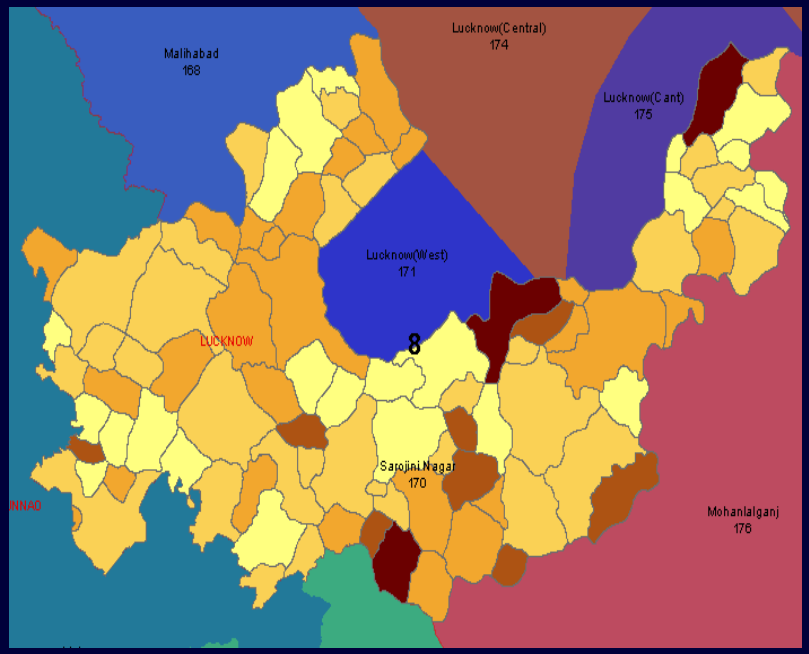
- Effective management and monitoring of polling stations.
- Prioritize the areas for new Polling stations and identification of polling station for additional deployment of forces.
- Overall prepare vulnerability mapping of different polling station ahead of polling





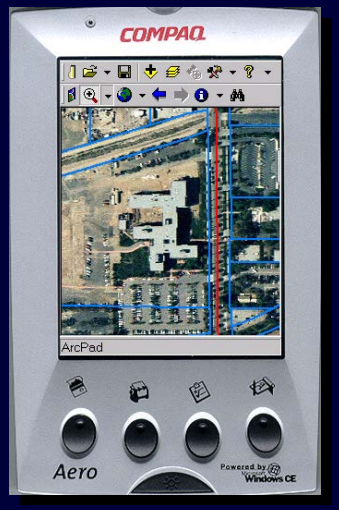
GIS will answer following queries like…

- Where the polling station is?
- What is the location of adjacent facilities?
- What are the places with records of sensitivity, violence or other activities?
- What is the shortest route to polling stations to major roads and amenities?
- Effective number of voters??
- Results of elections??
- Restructuring or redeployment of polling stations, if required.
- Electronic database of persons on elections duty.

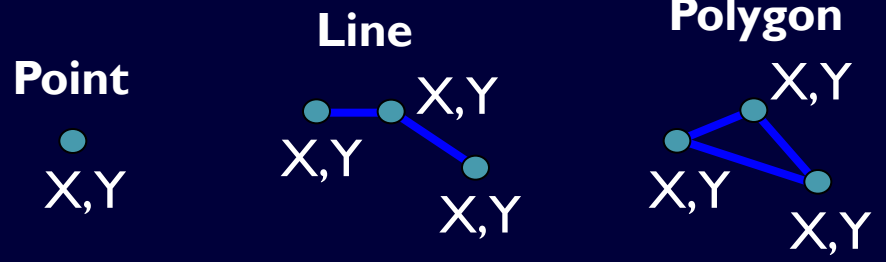


Mapping of Polling Stations

- GPS Device calculates locations in form of Longitude & Latitude (X & Y).
- GPS Enabled device can have Software for GIS Data generation on field. It means that polling stations and other utilities can be plotted as POINTS on the device, which will take shape of a map in later stage.
- Roads can be plotted as LINES and other closed proximities like parks, buildings can be mapped as POLYGONS.



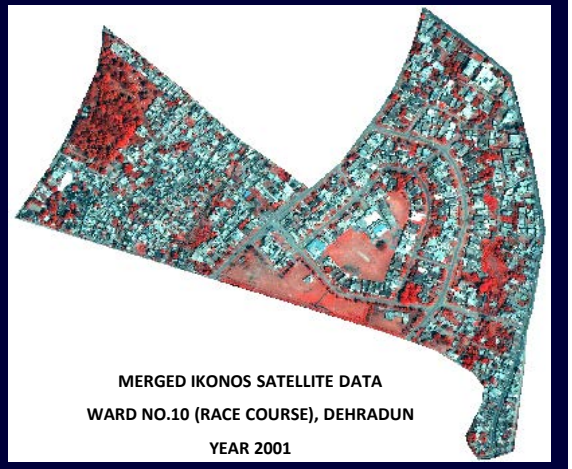
Smart Phones

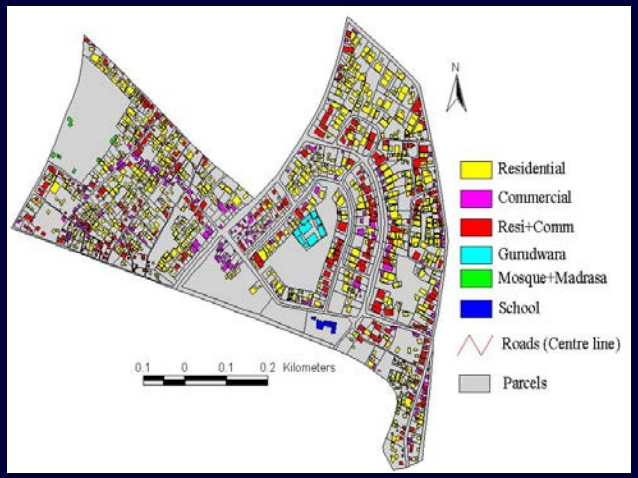


Data can be collected on the real time using GPS & Location Based Devices/Smart Phones.

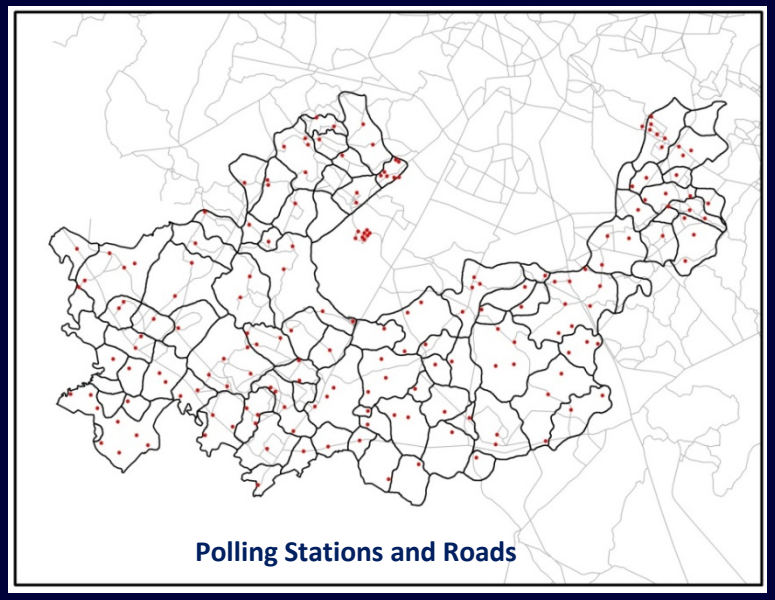
Collect GIS Data

- Through Field Mapping using GPS
- Through Satellite Images
- Existing Data

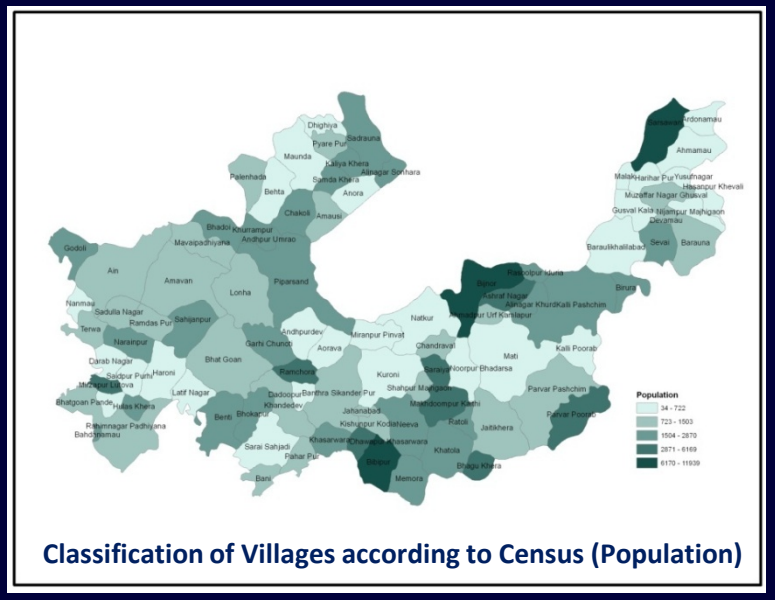




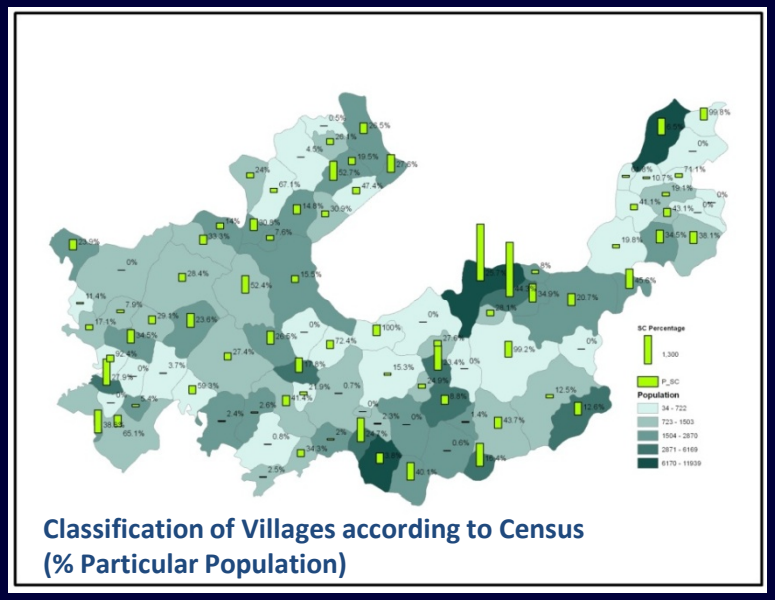
Election Data Representation in GIS



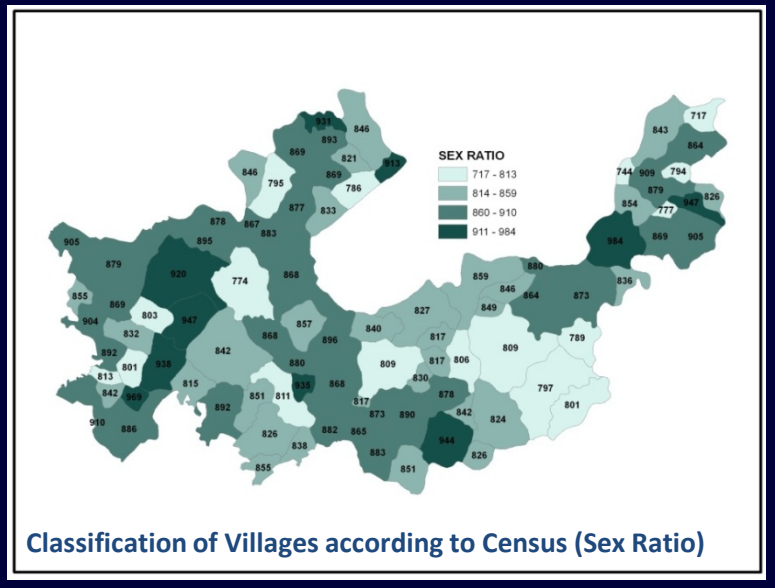
Polling Stations and Roads



Classification of Villages according to Census (Population)

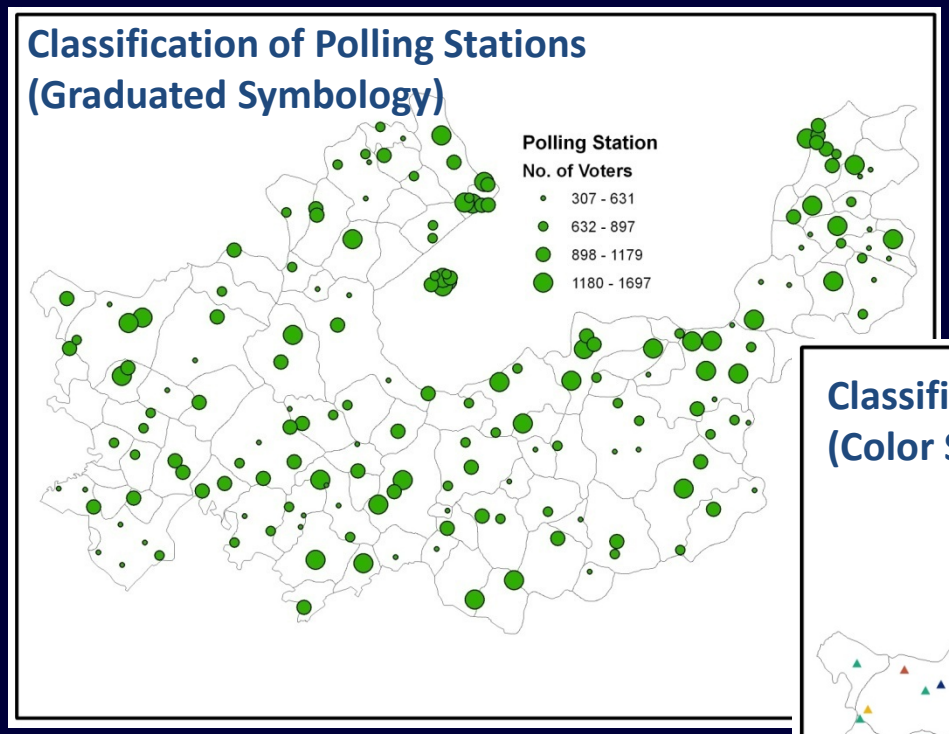


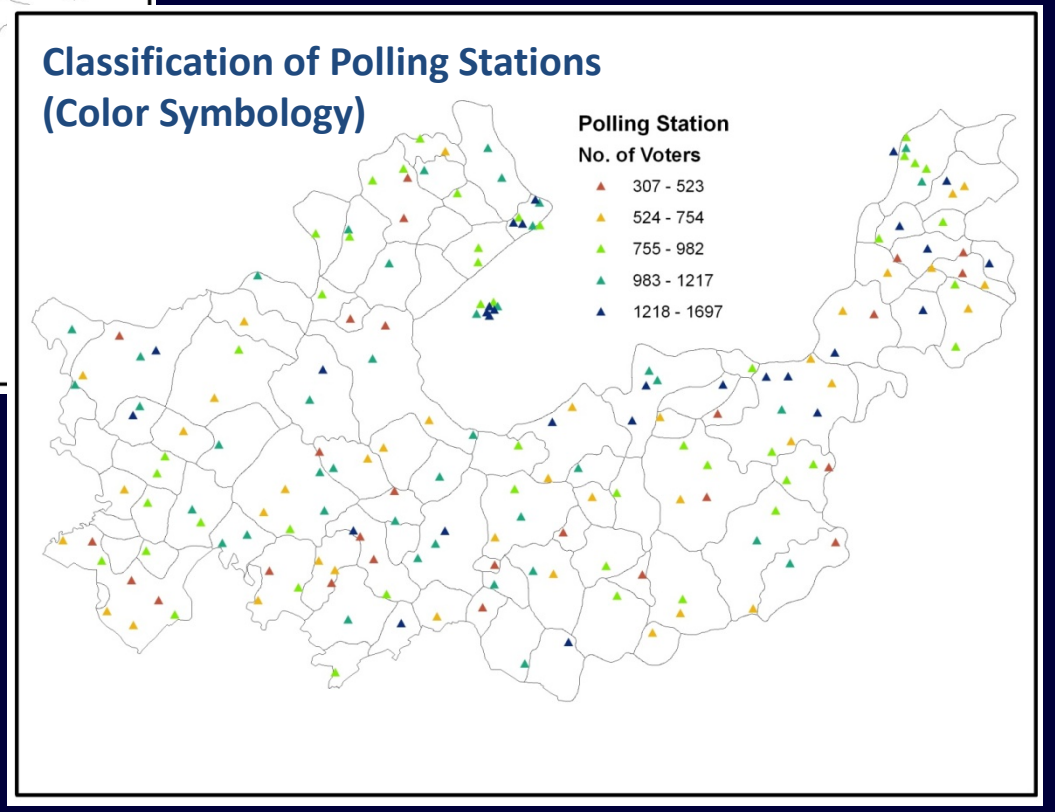
Classification of Villages according to Census
(% Particular Population)



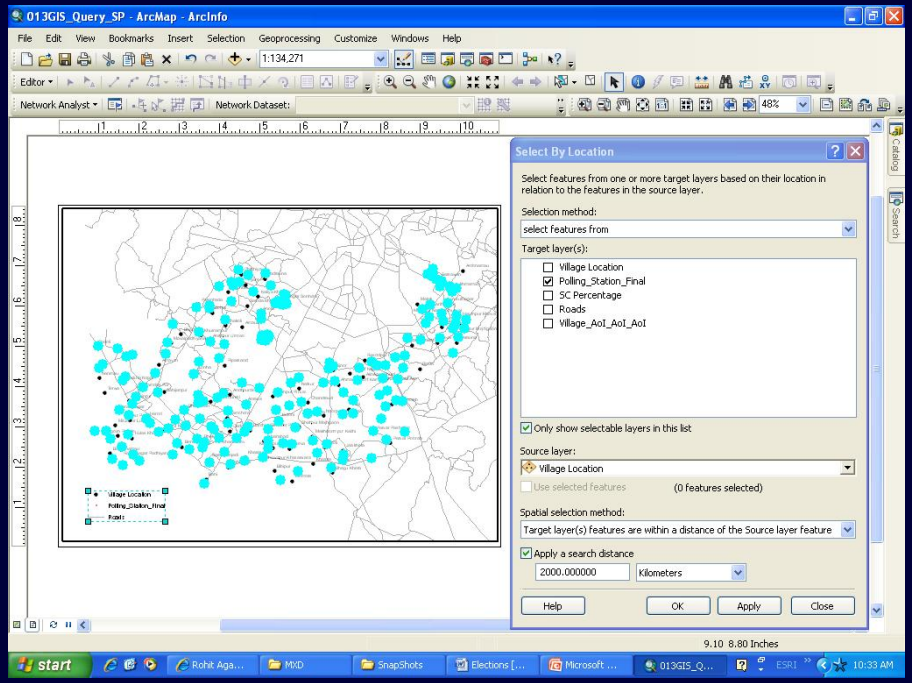
Classification of Villages according to Census (Sex Ratio)

Election Data Representation in GIS



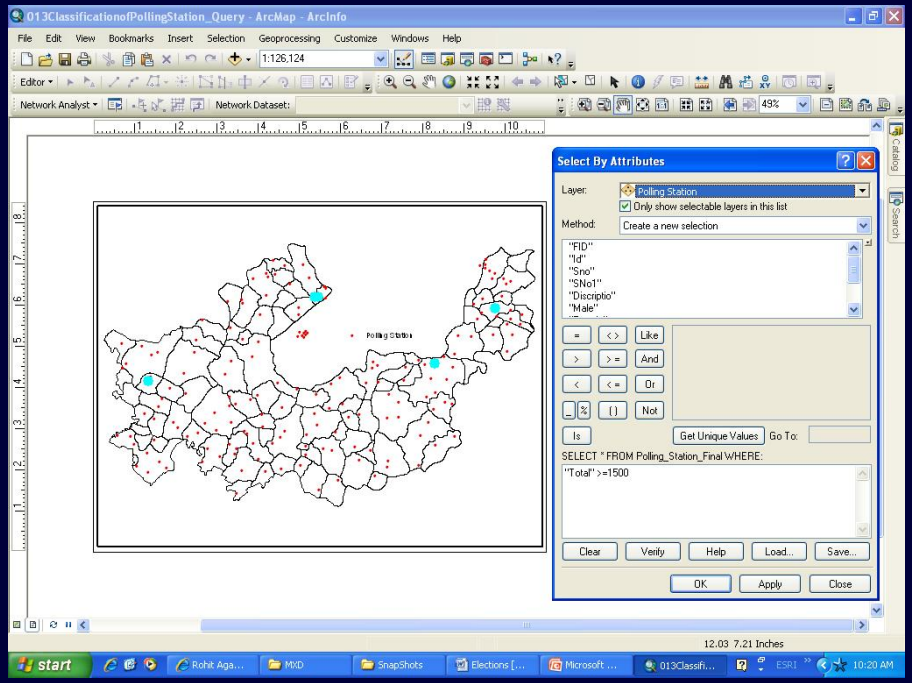


Election Data Analysis using GIS



GIS Queries: Spatial

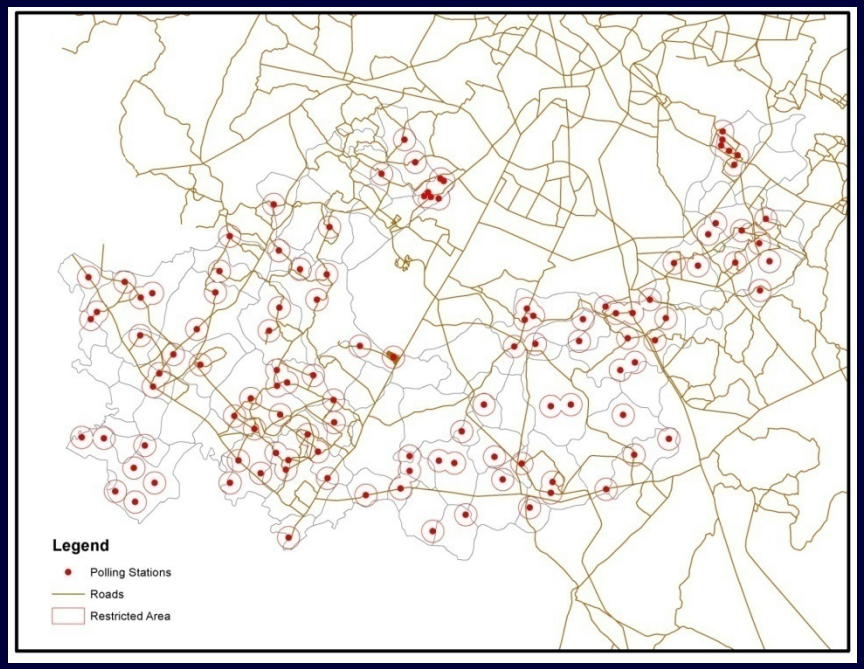
(Polling Stations with in 2 km distance of village settlement)



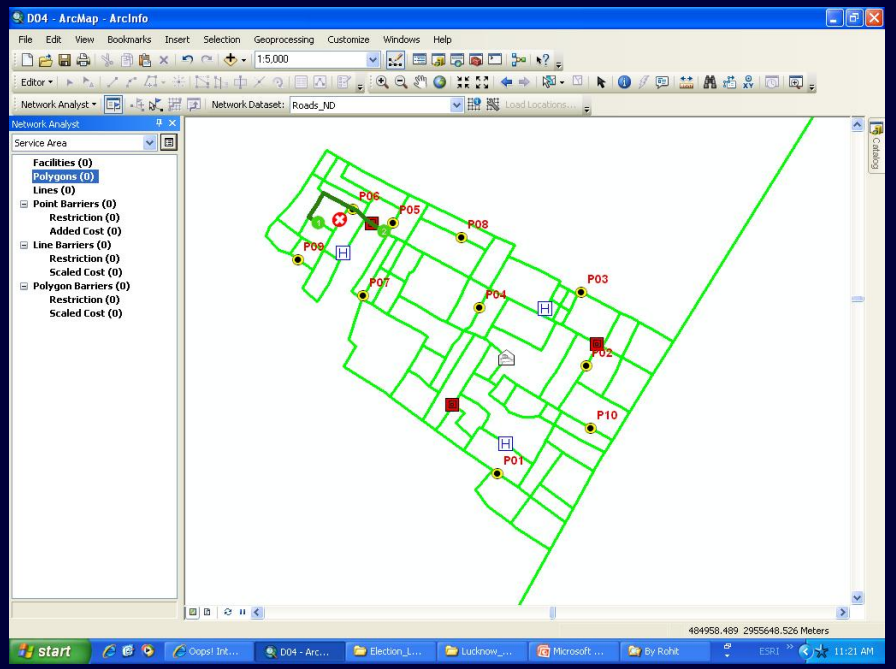
GIS Queries: Non-Spatial

(Polling Stations catering voters >=1500)

Election Data Analysis using GIS

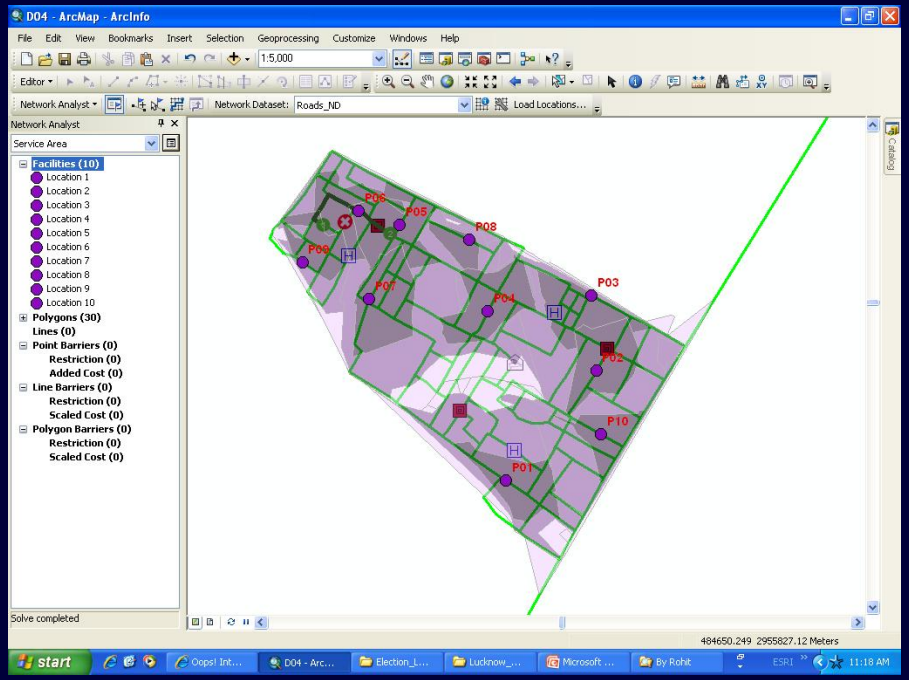


Restrictions: Non Approachable Area (During Elections)

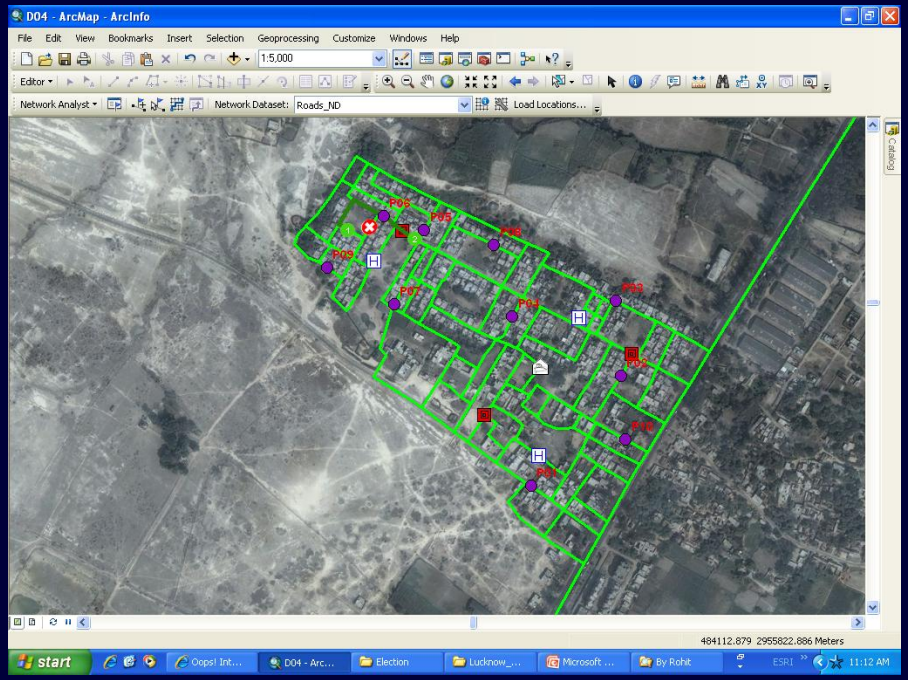


Shortest Route Analysis

Election Data Analysis using GIS



Service Area Mapping



Design GIS: Prepare Interactive Maps

Election Commission AP

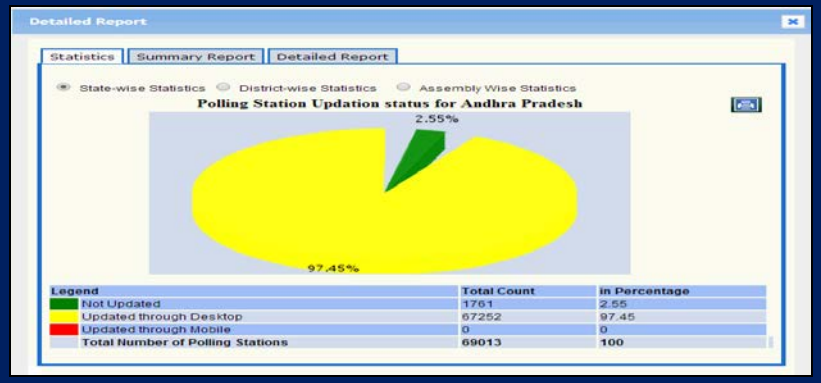
"Role Based Access – HQ, District (23 Nos), Assembly (294 Nos) login"

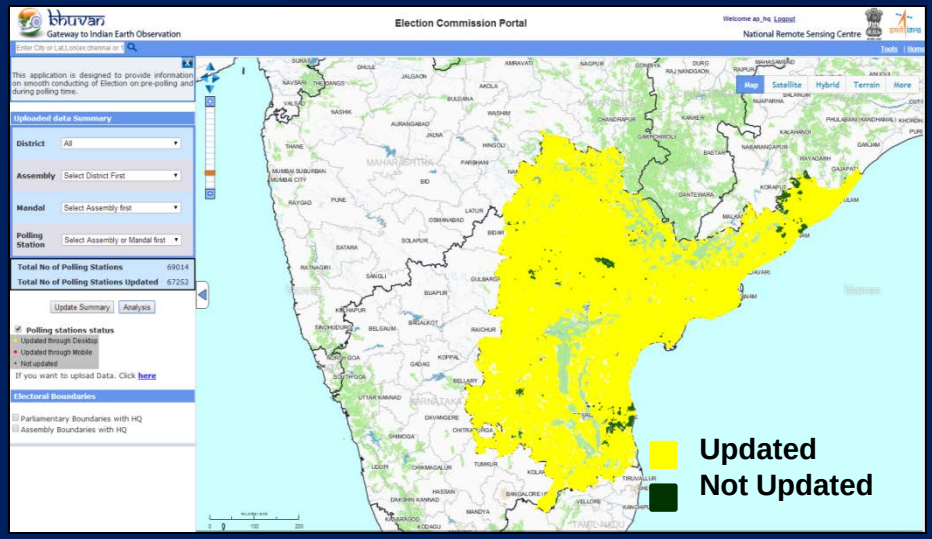
1. Basic Minimum Features (BMF)

Facility to collect 17 parameters of each Polling station by provisioning of Web Interface/Mobile App towards smooth conducting of Polling

2. Analysis & Reports

- State/District/Assembly wise statistics on updates and Spatial View
- Download as Excel





Total No of Polling Stations 69014

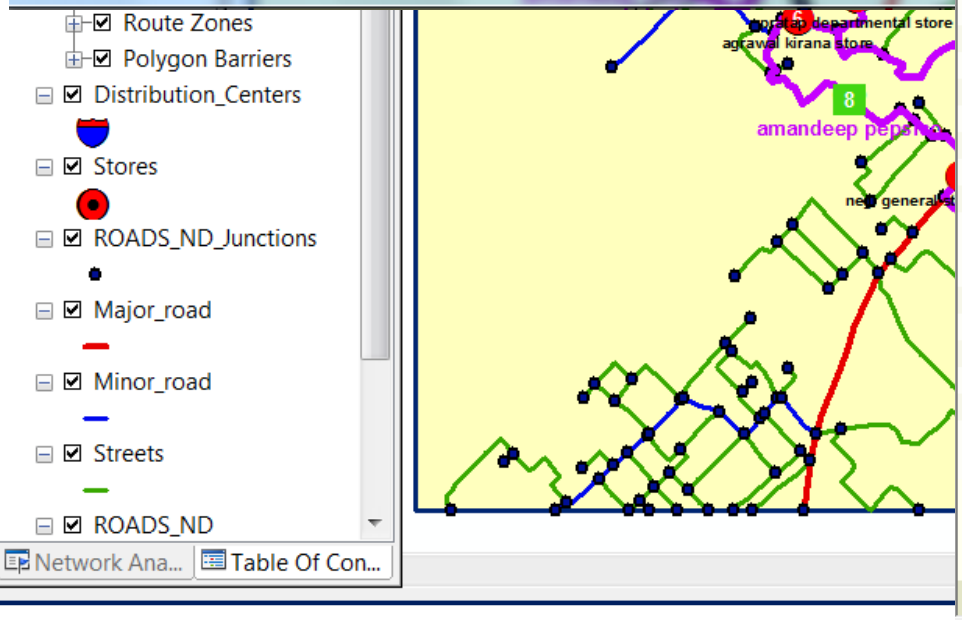
Updated Polling Stations 68825

Transportation GIS

Directions (Vehicle Routing Problem)

[+]	Route: Vehicle_1	2896.5 m	4 hr 10 min	Map
[+]	Route: Vehicle_2	5232.2 m	8 hr 3 min	Map
[+]	Route: Vehicle_3	8361.3 m	7 hr 35 min	Map
[+]	Route: Vehicle_4	8549.1 m	8 hr 30 min	Map
[+]	Route: Vehicle_5	7172.9 m	7 hr 15 min	Map
[+]	Route: Vehicle_6	6338.9 m	8 hr 27 min	Map
[+]	Route: Vehicle_7	3427.6 m	7 hr 46 min	Map

Options... | Print Preview... | Save As... | Print



Directions (Vehicle Routing Problem)

[-]	Route: Vehicle_1	2896.5 m	4 hr 10 min	Map
1:	Start at agrawal distributor Time Window: 8:00 AM - 5:30 PM Service Time: 40 min		40 min	Map
2:	Go east on street13 toward street12	14 m	< 1 min	Map
3:	Turn right on DHARAMPUR CHAUK NAVJYOTI HOSPITAL ROAD	362.4 m	< 1 min	Map
4:	Make sharp left on EXCISE CUSTOM ROAD	161.6 m	< 1 min	Map
5:	Turn right on MANAV BHARTI NEHRU COLONY ROAD	376.2 m	< 1 min	Map
6:	Turn right on street70	40 m	< 1 min	Map
7:	Arrive at pathak jeneral and provision store, on the left Time Window: 9:30 AM - 9:53 AM Service Time: 34 min		34 min	Map
8:	Depart pathak jeneral and provision store			
9:	Go back northwest on street70	40 m	< 1 min	Map
10:	Turn right on MANAV BHARTI NEHRU COLONY ROAD	393.2 m	< 1 min	Map
11:	Turn left on NEHRU COLONY THANA ROAD	215.7 m	< 1 min	Map
12:	Arrive at abhay general store, on the right Time Window: 10:25 AM - 10:40 AM Service Time: 25 min		25 min	Map
13:	Depart abhay general store			
14:	Continue northwest on NEHRU COLONY THANA ROAD	344.3 m	< 1 min	Map
15:	Turn left on street23	72.1 m	< 1 min	Map
16:	Arrive early at chanchal goods merchant Time Window: 11:40 AM - 12:10 PM Wait Time: 47 min Service Time: 40 min		1 hr 27 min	Map
17:	Depart chanchal goods merchant			
18:	Continue southwest on street23	129.1 m	< 1 min	Map
19:	Turn left on B BLOCK LAKSHMI COLONY ROAD	52.4 m	< 1 min	Map
20:	Continue on PARK TO BLOCK B ROAD	29.1 m	< 1 min	Map
21:	Turn right on PARK EXCISE ROAD	87.7 m	< 1 min	Map
22:	Turn left on street8	8.8 m	< 1 min	Map
23:	Turn right on street9	109.5 m	< 1 min	Map
24:	Turn left on LIC ROAD	23.3 m	< 1 min	Map
25:	Arrive early at sanjay electronics Time Window: 12:50 PM - 1:00 PM Wait Time: 29 min Service Time: 20 min		49 min	Map
26:	Depart sanjay electronics			
27:	Go back northwest on LIC ROAD	73.3 m	< 1 min	Map
28:	Turn left on PARK EXCISE ROAD	138.7 m	< 1 min	Map
29:	Turn right on DHARAMPUR CHAUK NAVJYOTI HOSPITAL ROAD	211.2 m	< 1 min	Map
30:	Turn left on street13	14 m	< 1 min	Map
31:	Finish at agrawal distributor, on the right Time Window: 8:00 AM - 5:30 PM Service Time: 10 min		10 min	Map
	Total time: 4 hr 10 min Total distance: 2896.5 m Total wait time: 1 hr 16 min Start time: 03-Jan-14 9:11 AM Finish time: 03-Jan-14 1:21 PM			
[+]	Route: Vehicle_2	5232.2 m	8 hr 3 min	Map

Options... | Print Preview...

Tourism : Amritsar

bhuvan Beta
Indian Earth Observation Visualisation

Welcome Bhuvanite

Visit | Stay | Food Hubs | Services | Travel | Economic | Others | Heritage Walk

Tools

Amritsar historically also known as Ramsadpurspur and colloquially as Ambarsar) is a city in the north-western part of India. It is the spiritual center for the Sikh religion and the administrative headquarters of the Amritsar district in the state of Punjab.

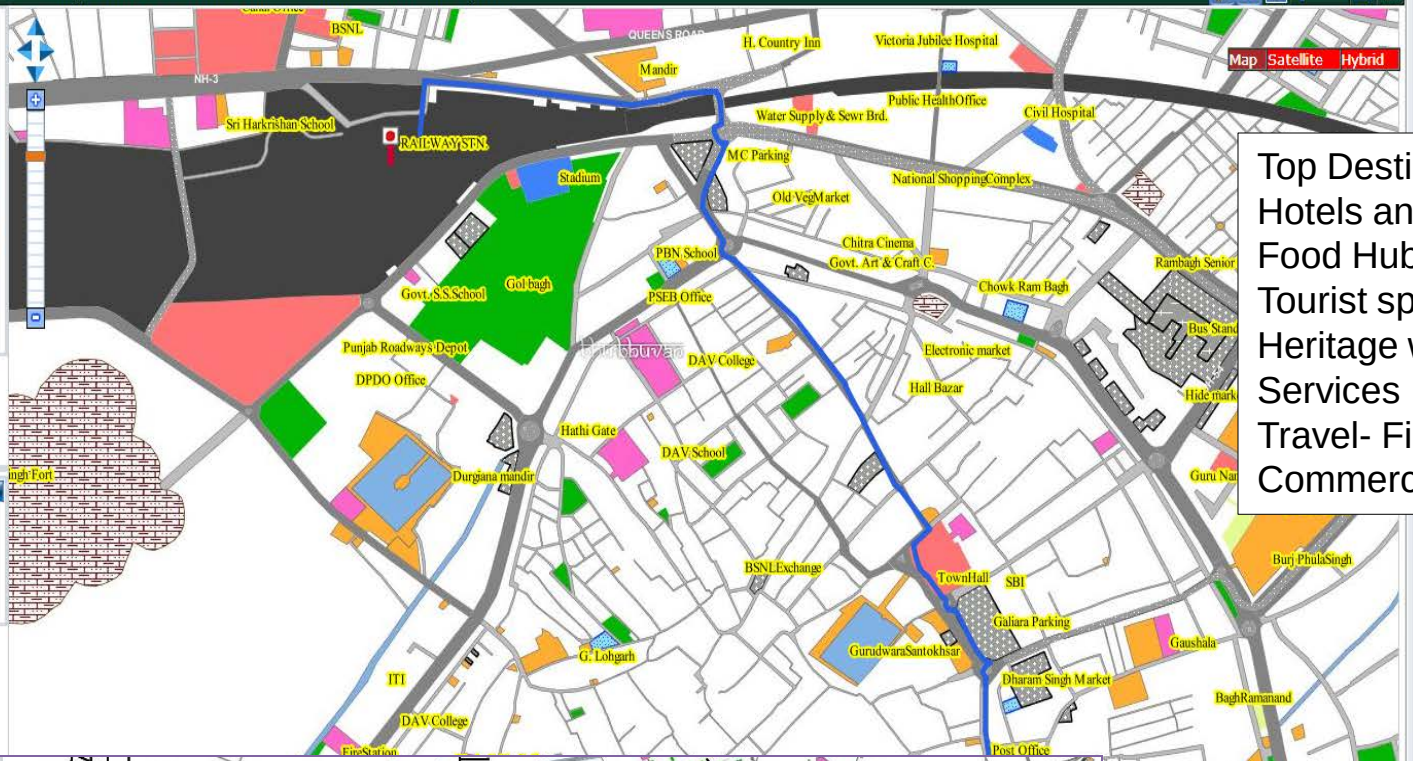
See the City: Amristar,punjab

Top Destination | Hotel | Travel

Start: BULLET MARKS

Destination: AMRITSAR RAILWAY STATION

Get Route



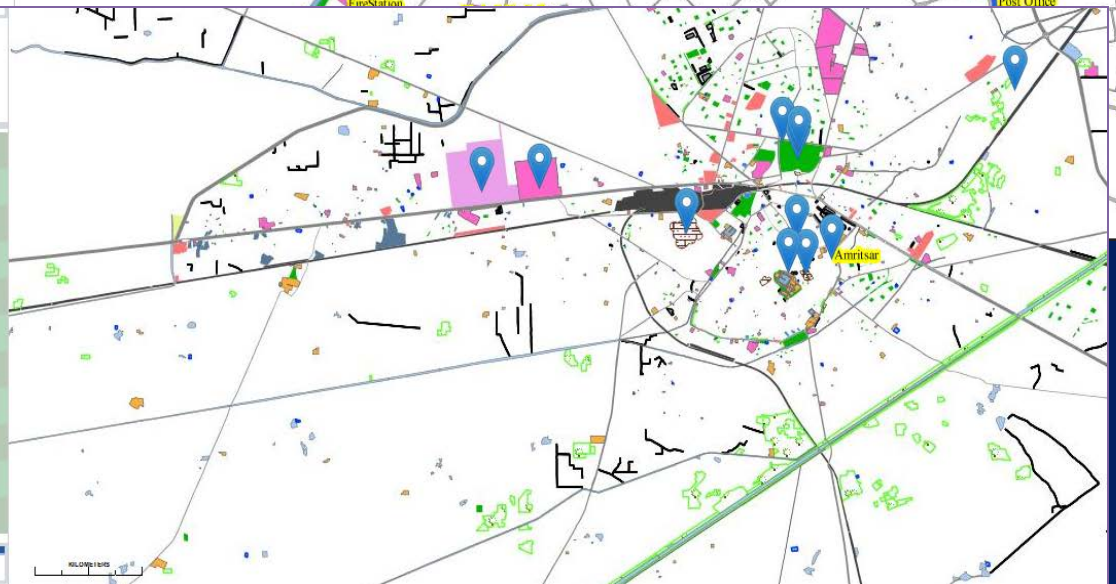
- Top Destinations
- Hotels and Stay
- Food Hubs
- Tourist spots
- Heritage walk
- Services
- Travel- Find Route
- Commercial

See the City: Amristar,punjab

Top Destination | Hotel | Travel

- Bagh Ramanand
- Town Hall
- Maharaja Ranjeet Singh Panorma
- Summer Palace
- Sun City Amusement Water Park
- Guru Nanak Dev University
- Khalsa College
- Gobindgarh Fort
- Rambagh Garden
- Jalianwala Bagh
- Golden Temple

Legend | Contact Us | Disclaimer | Feedback

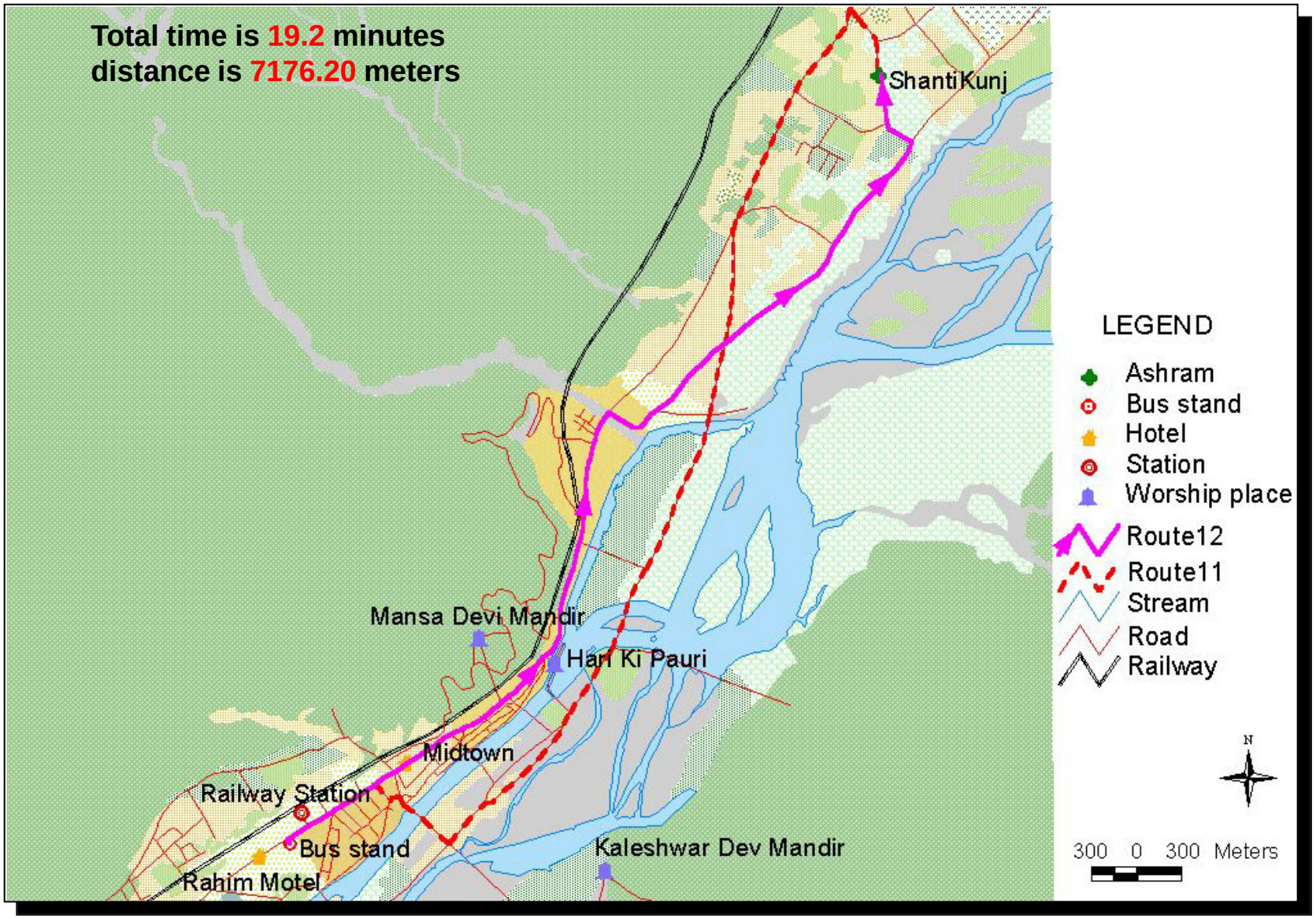


Tourism

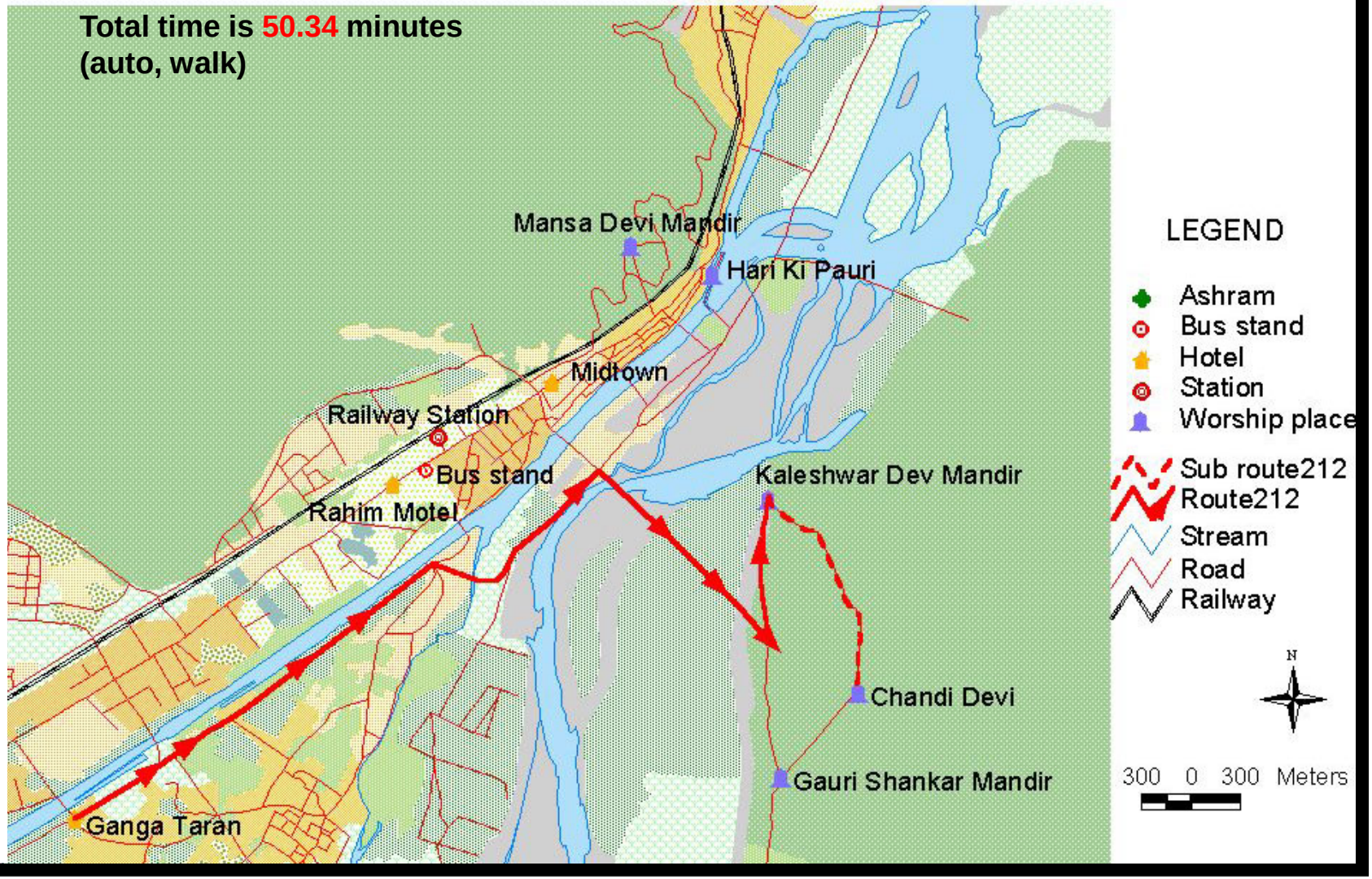
Archaeological Sites

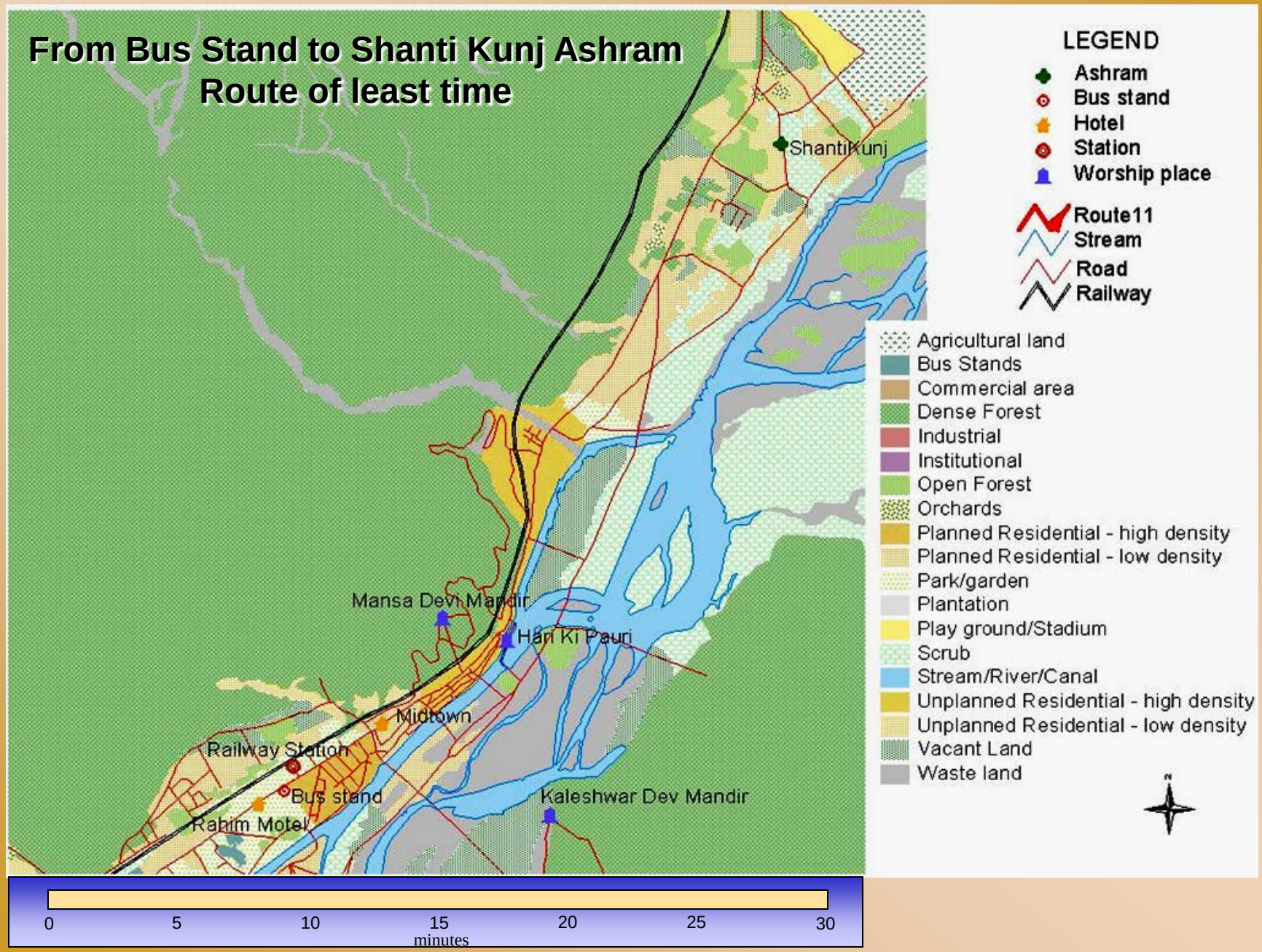
Nalanda
Badami
Hampi
Vijayawada

The shortest route in terms of distance from Bus Stand to Shanti Kunj using auto



The shortest route in terms of time from Ganga Taran hotel to Chandi Devi Mandir




From Bus Stand to Shanti Kunj Ashram
Route of least time
Shantikunj
Mansa Devi Mandir
Hari Ki Pauri
Midtown
Railway Station
Bus stand
Rahim Motel
Kaleshwar Dev Mandir
LEGEND
Ashram
Bus stand
Hotel
Station
Worship place
Route11
Stream
Road
Railway
Agricultural land
Bus Stands
Commercial area
Dense Forest
Industrial
Institutional
Open Forest
Orchards
Planned Residential - high density
Planned Residential - low density
Park/garden
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Unplanned Residential - high density
Unplanned Residential - low density
Vacant Land
Waste land
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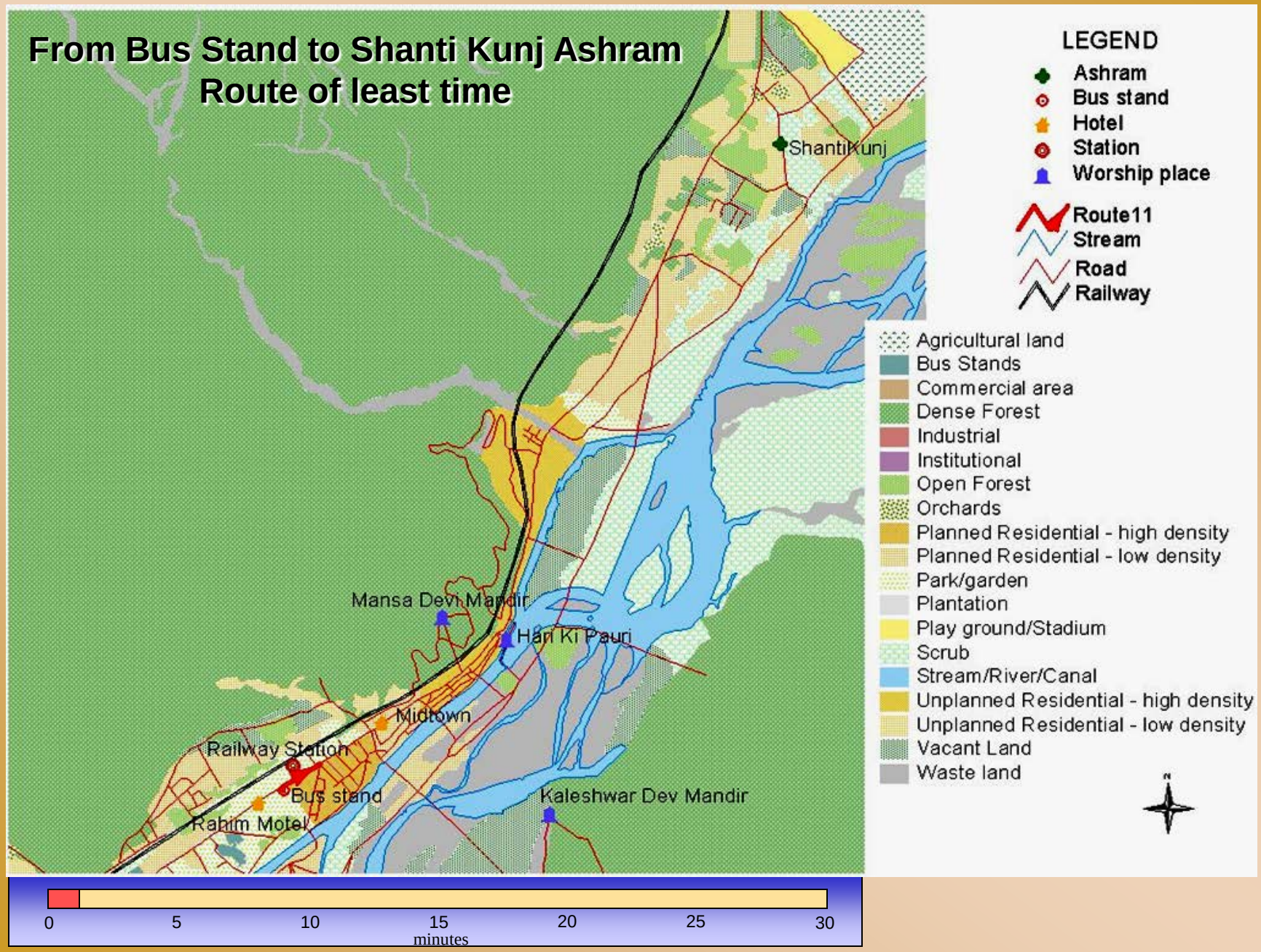
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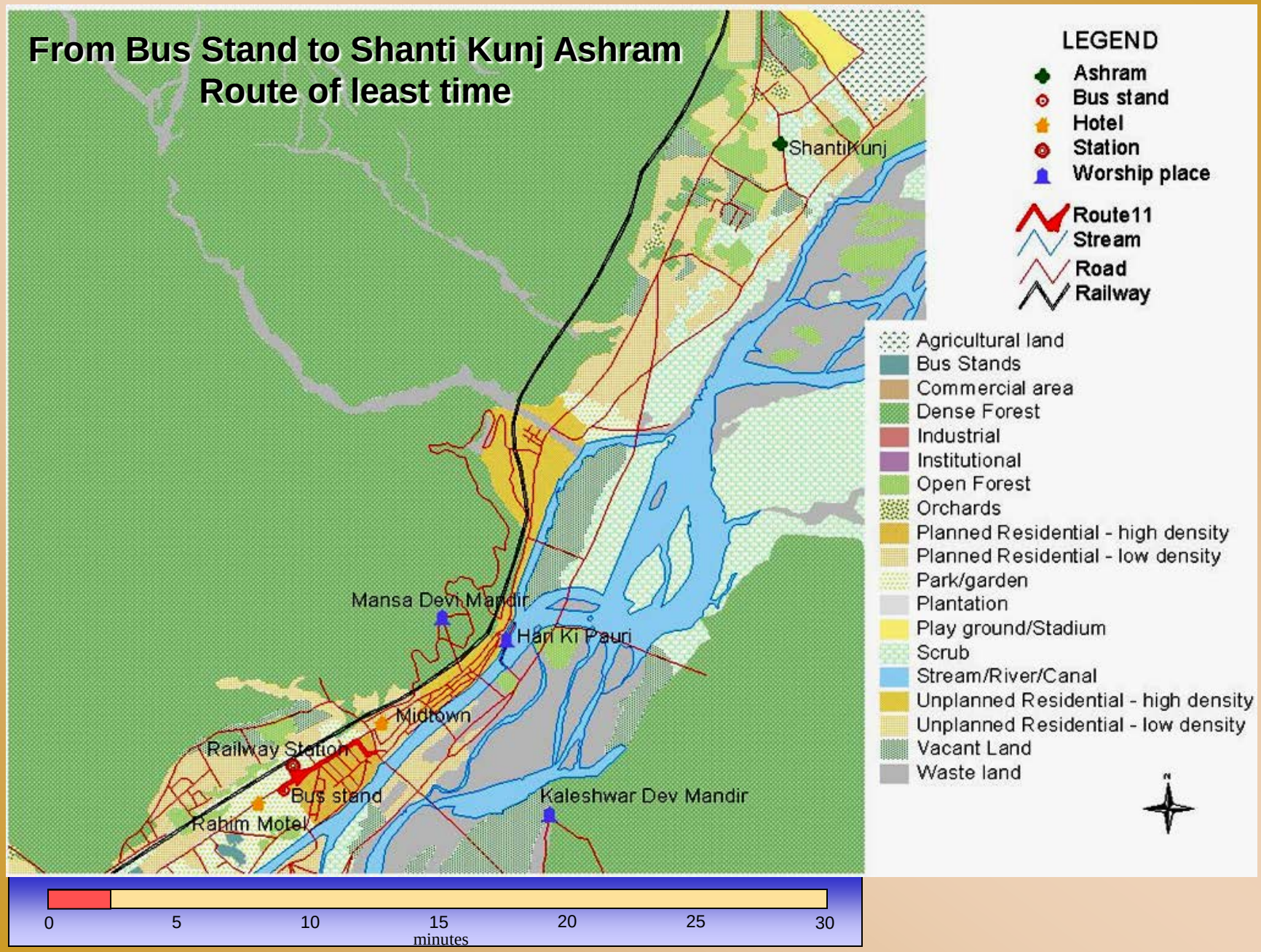
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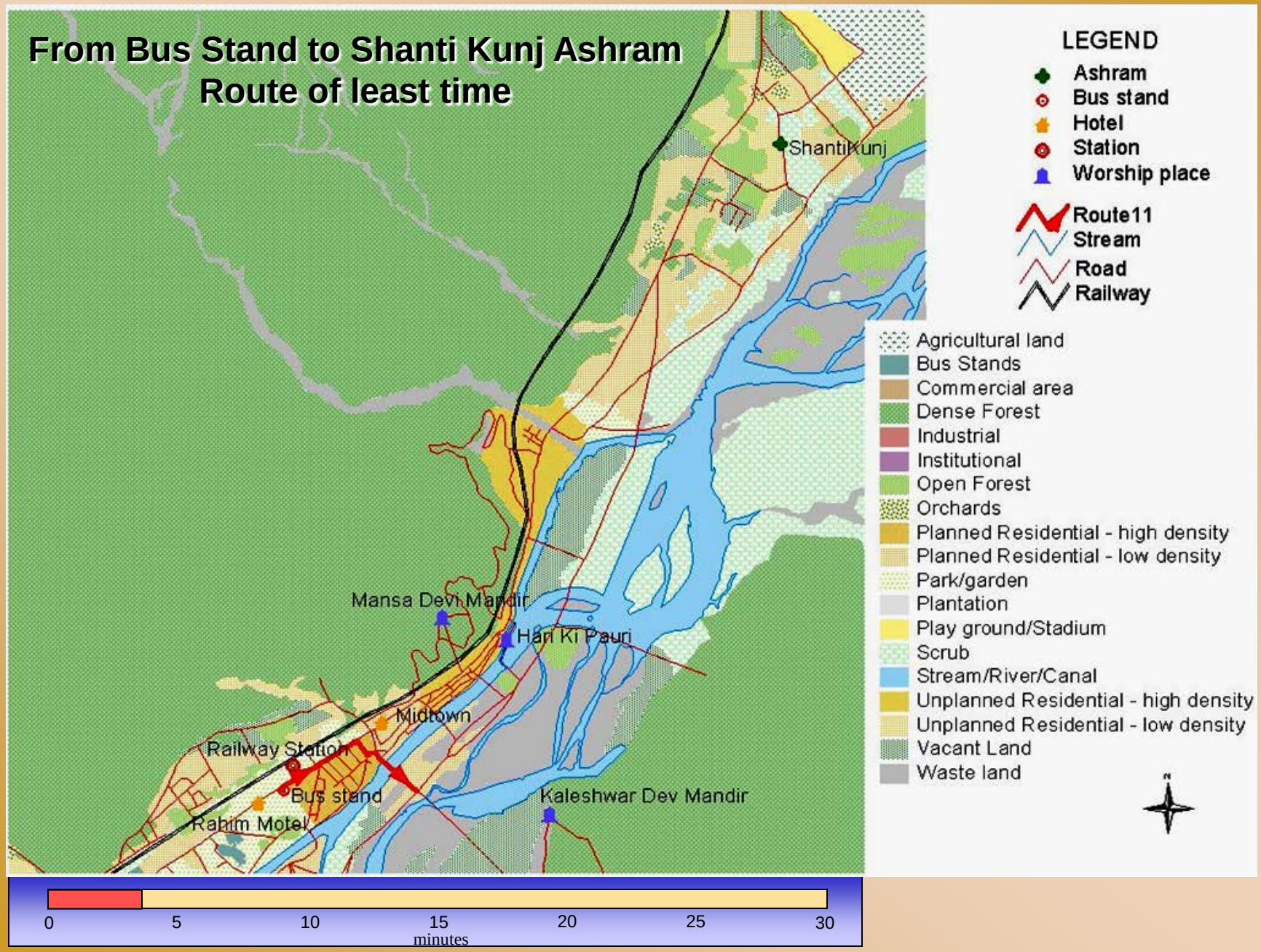
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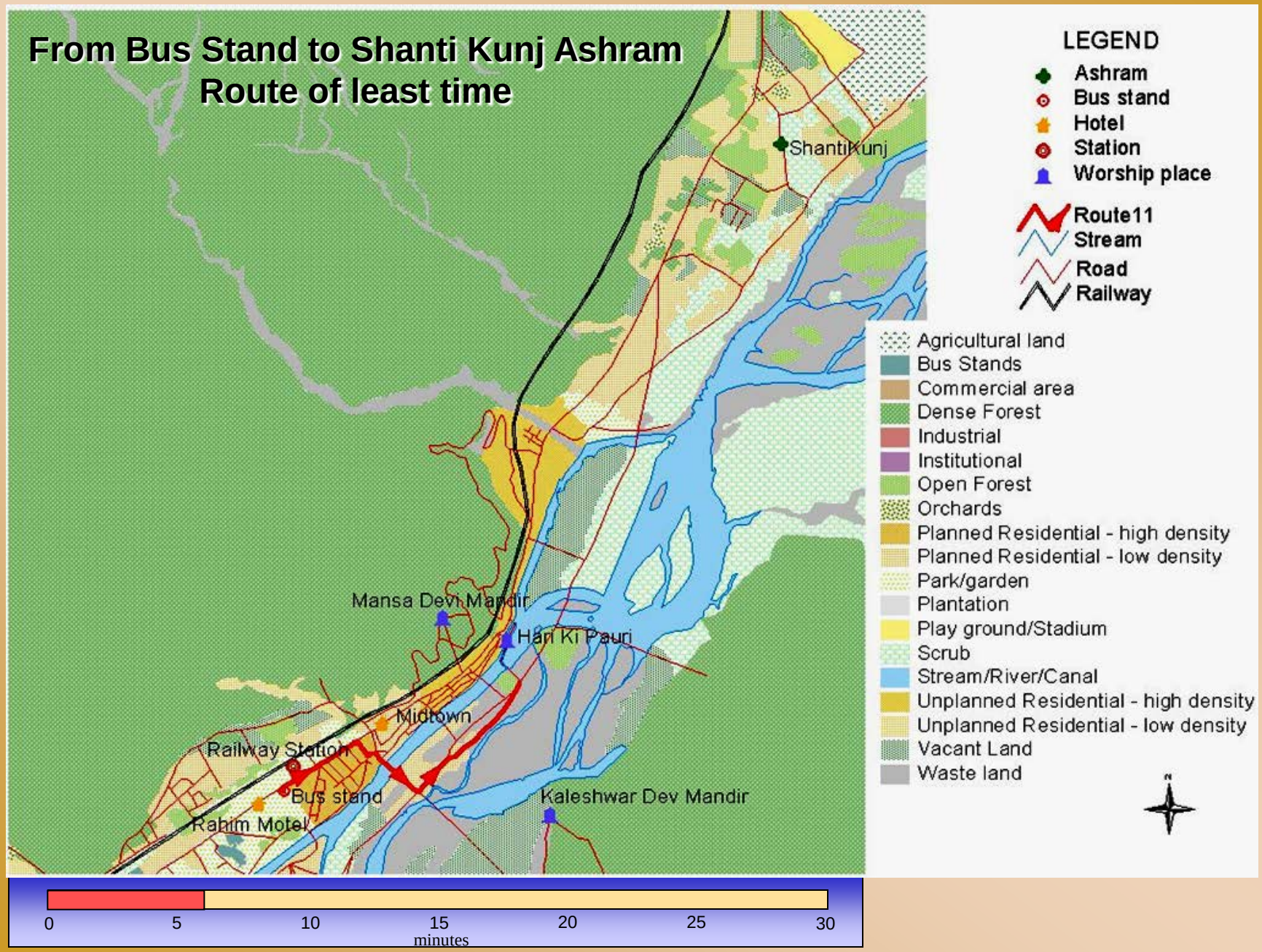
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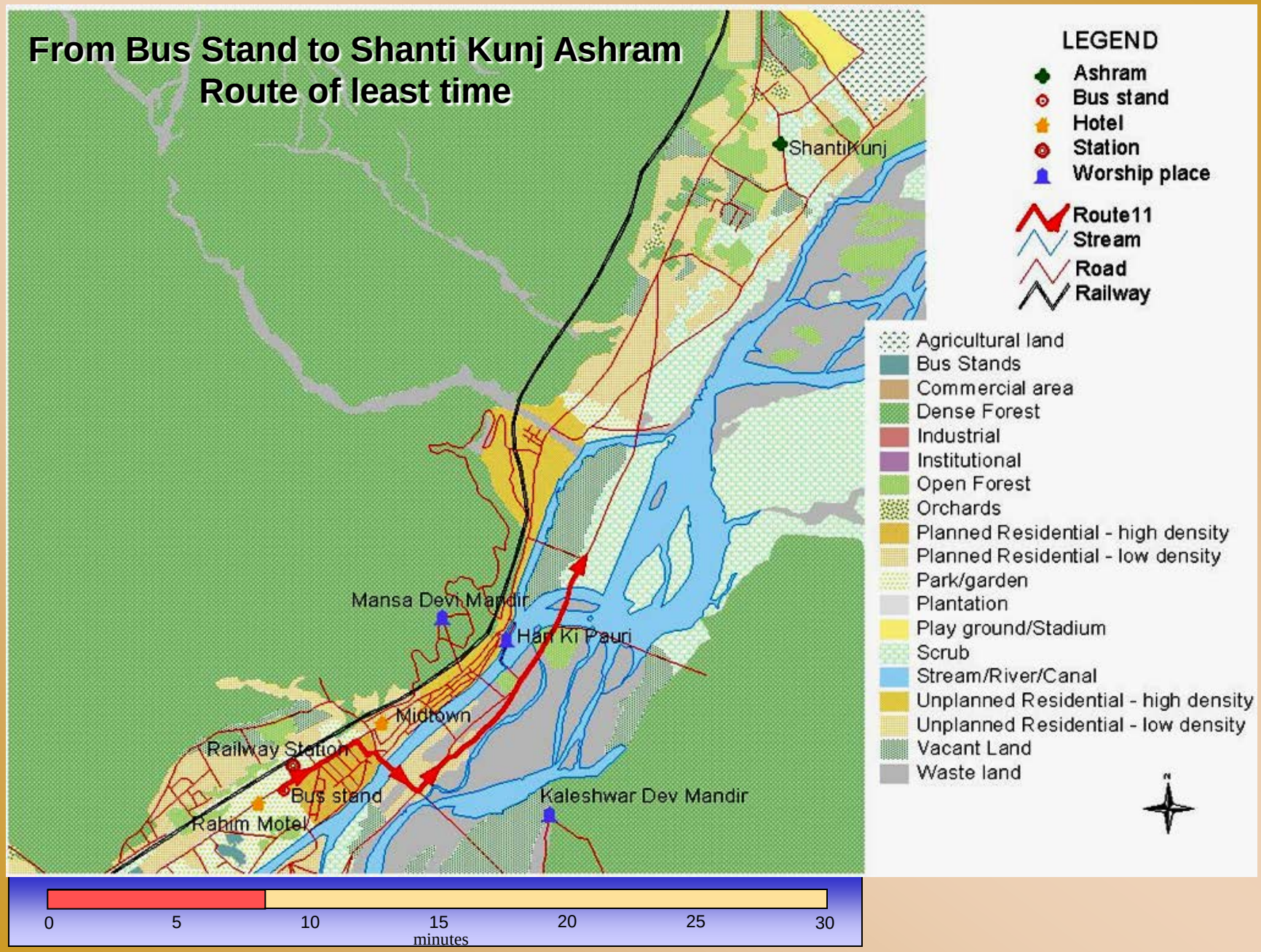
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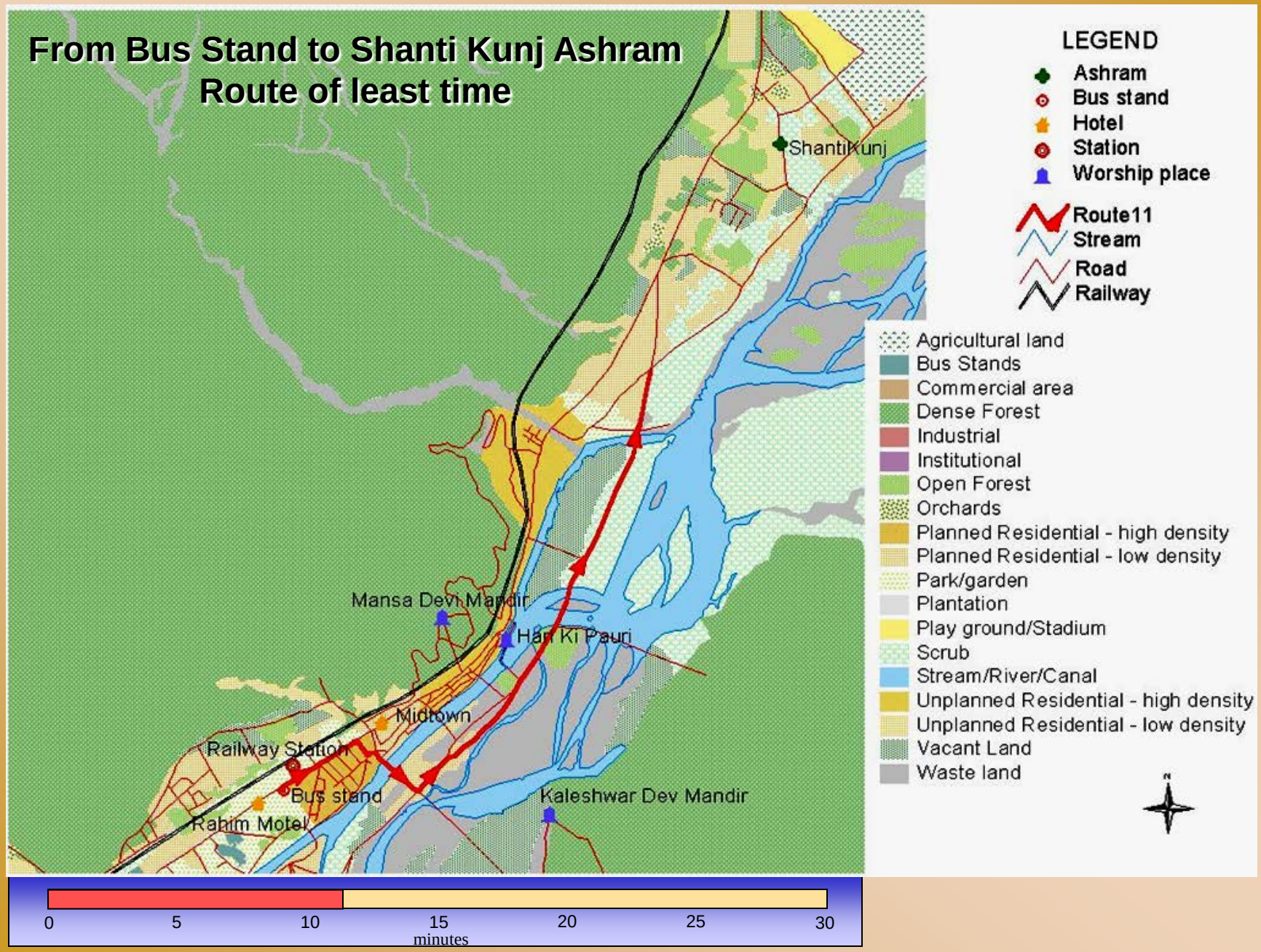
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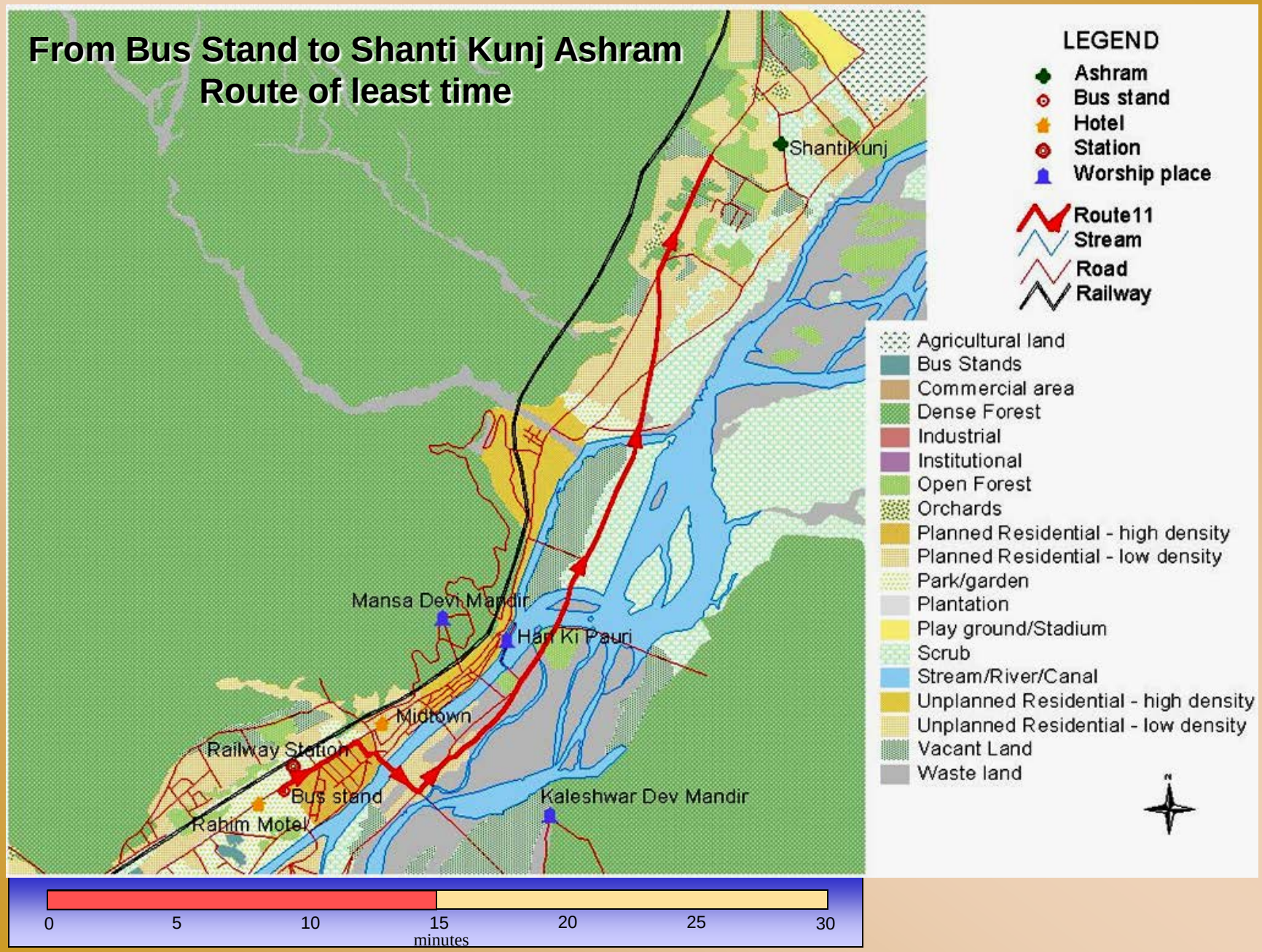
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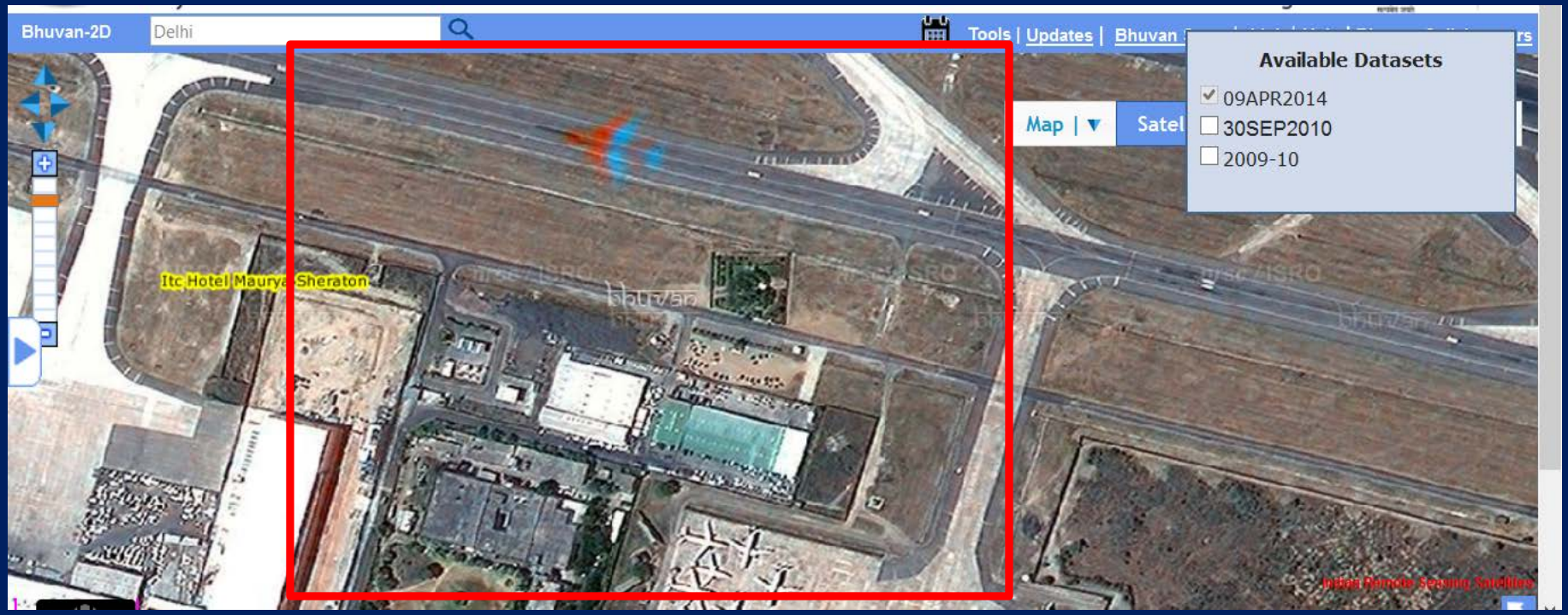
GIS based Monitoring

Monitoring: Historical Data viewer

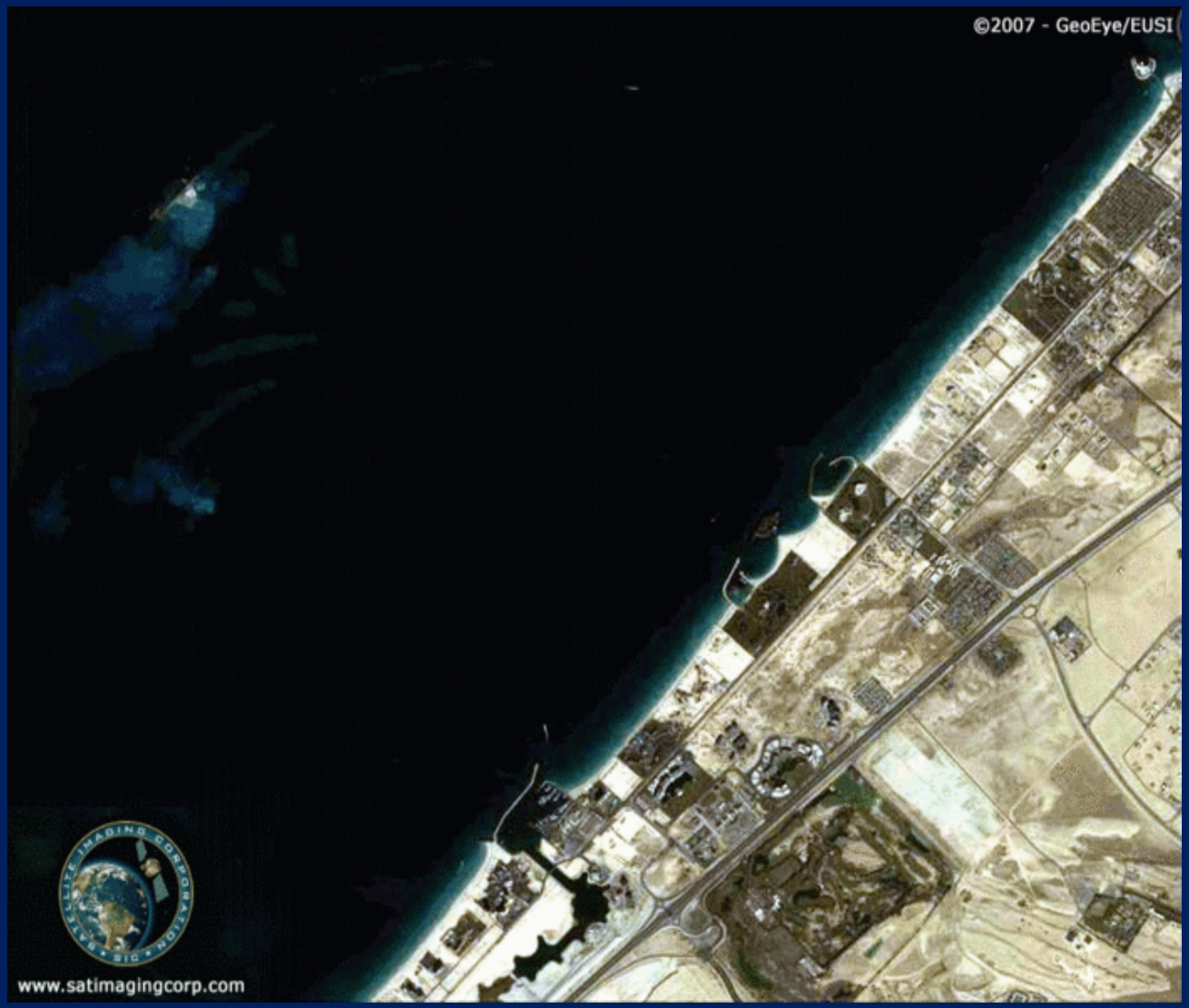


Delhi International Airport – 2010 vs 2014

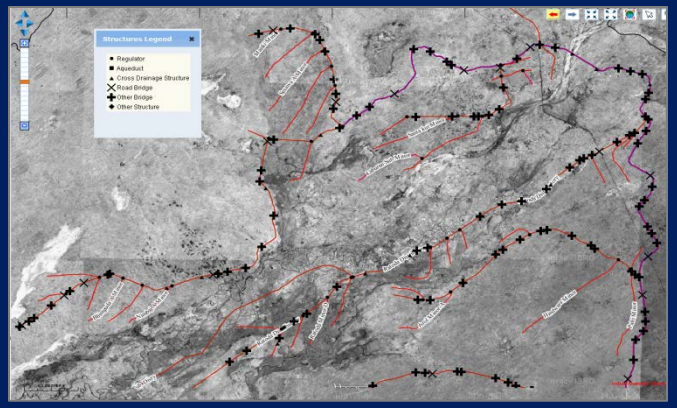
"multi-date view of all available High resolution data sets based on view extent and available layers along with date of pass information"

Time lapse Animation of Construction using High Resolution Images

Time lapse Animation of Palm Islands using High Resolution Images



WebGIS Services : Applications on Bhuvan
Accelerated Irrigation Benefit Program (AIBP)



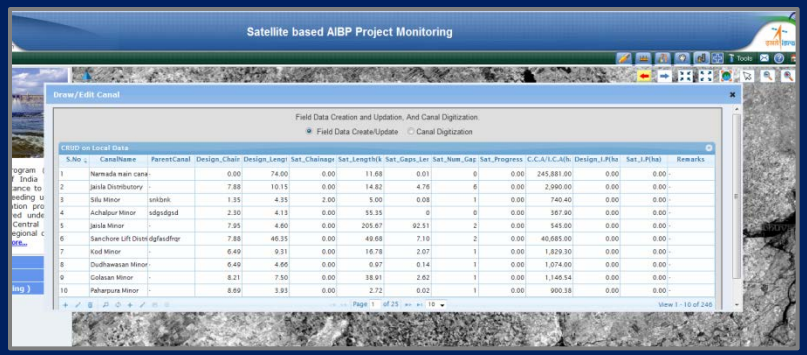
Inventory : 103 Projects

- Bhuvan – AIBP Portal: Facilitates Visualization of Irrigation projects carried under 2 Phases
  - Phase-I : 53 Projects
  - Phase-II: 50 Projects
  - Phase-III: Ongoing
- Datasets Available for Visualization:
  - Canal Networks,
  - Canal Boundaries,
  - Hydraulic Structures

Monitoring the Canal progress on Bhuvan

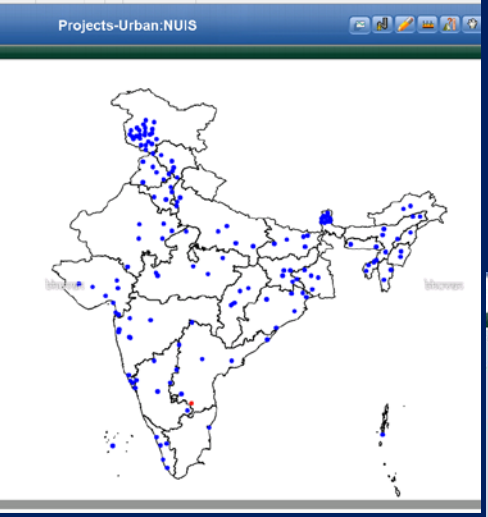
Phase-III: This module is for the Ongoing projects facilitating CWC officials for the Online monitoring through Satellite data and Digitization Tools available.

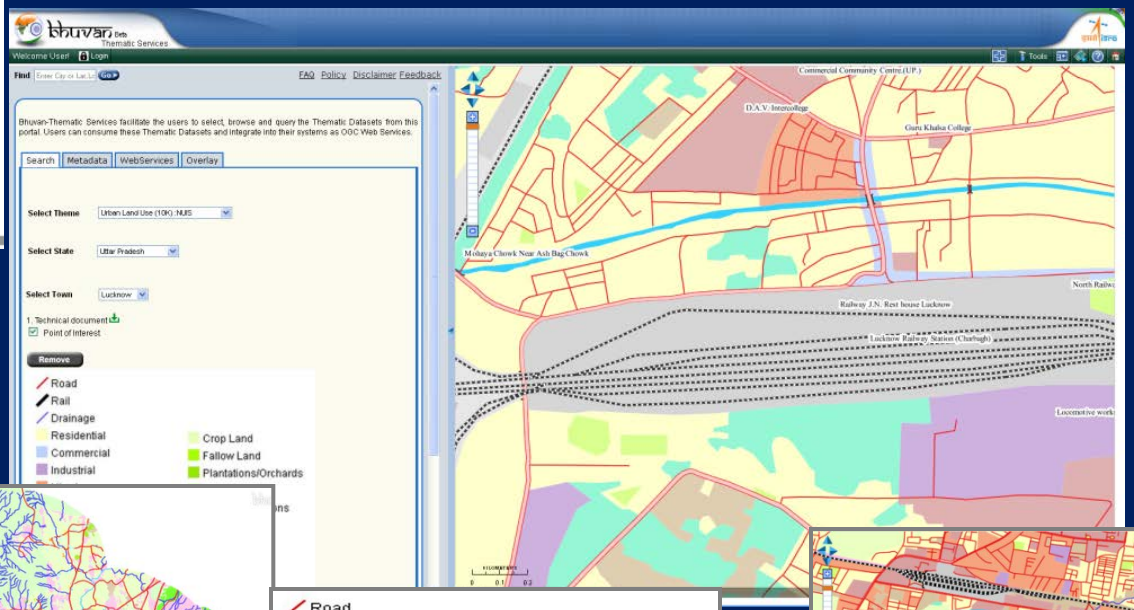
- Salient Features:
  - Canal Digitization: Facilitates digitization of Canal Networks with Calculation of total Canal Length, No. of gaps, Gaps Segments Length through help of Cartosat data.
  - Add Content option for Remark Notification
  - 3 levels of Access Control
  - Data Editing facility for Field Data.

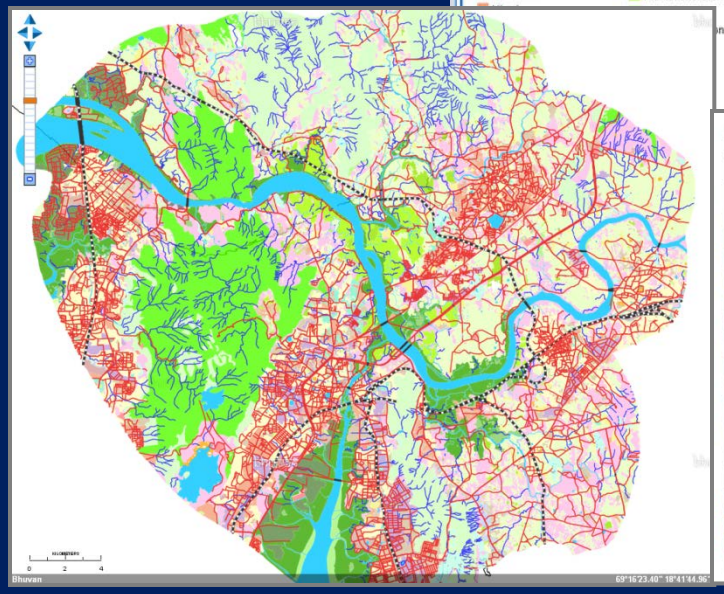


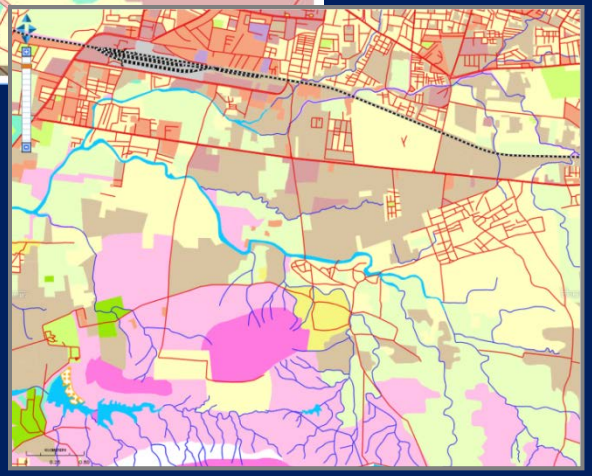
Urban Information System

NUIS : 139 towns









http://bhuvan-noeda.nrsc.gov.in/theme/thematic/theme.php?theme=nuis

Bhuvan Cell, NRSC

Urban Master Plan Formulation on Bhuvan

Salient features

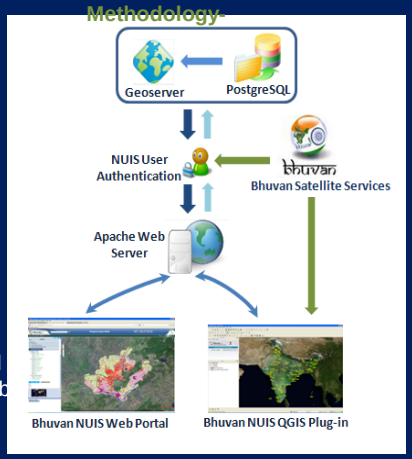
- Open source freely available GIS software package.
- Use Bhuvan WMS service for data creation.
- Authenticated login system with valid username and password.
- User can create and upload the data .
- Versions of spatial data is maintained in case of Rejected spatial data.
- Alert notifications for users for nay new updates.
- Online communication /feedback facility.
- Video Tutorial and user manual for training.
- Helps the user for easy and effective urban planning.

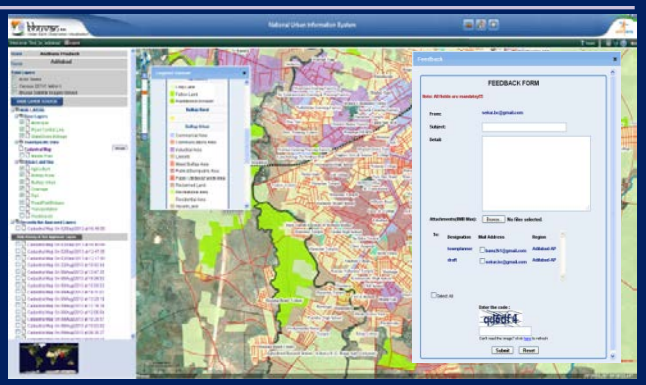
WEB APPLICATION FOR NUIS

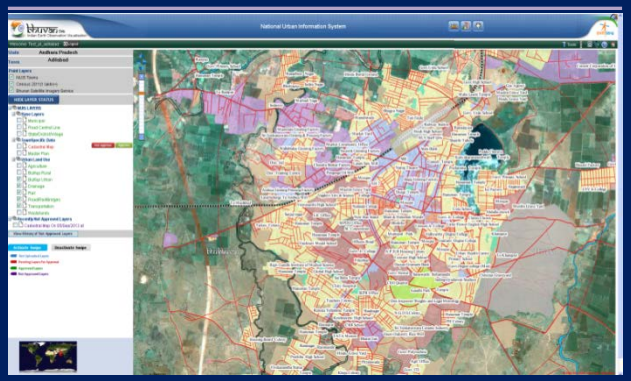
- **Citizen View**
  - Overlay of Master Plan and Vector Layers.
  - Time series visualization.
  - Feed back.
- **Town specific View** :Authentication to specific town.
  - Junior Level Officer
    - Upload data(Raster and vector).
  - Second Level officer
    - Approve or Reject the data after visualization.
    - Spatial data versioning.
    - Status Notifications.
  - Higher Level Officer
    - Visualization.
- **State specific view** :Authentication to all of selected state.
- **Nation Specific View**: Authentication to state and town.

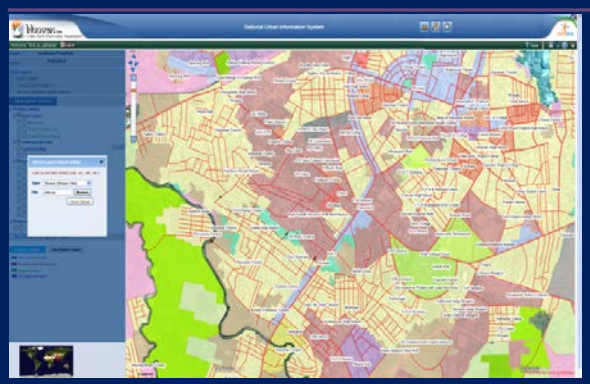
Bhuvan NUIS Plug-in in QGIS software

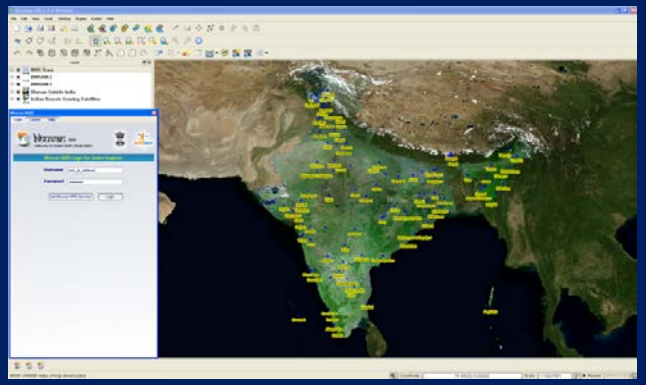
- Gateway for Client to Bhuvan server communication.
- Single point data management.
- Consuming of Bhuvan satellite services for change visualization in single click.
- Data uploading from client end without browser based environment.
- Serving the uploaded data as web map service.
- Hierarchical user management and data versioning at server end.
- Proper logging and data archival .
- Modification of existing data at client end and updation at server end and using Bhuvan web services.
- Help module for Plug-in functionalities.

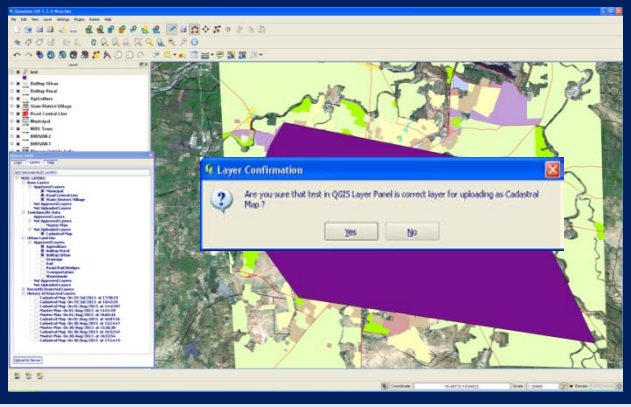


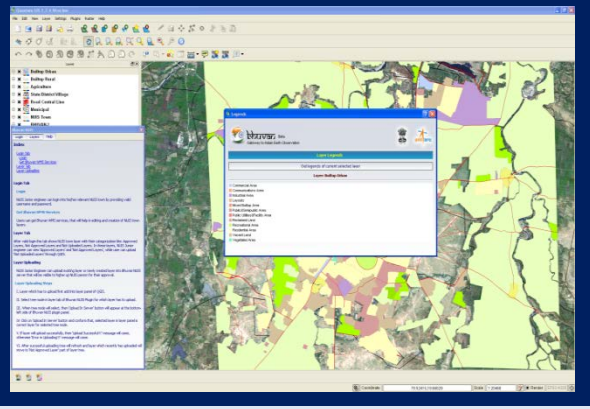












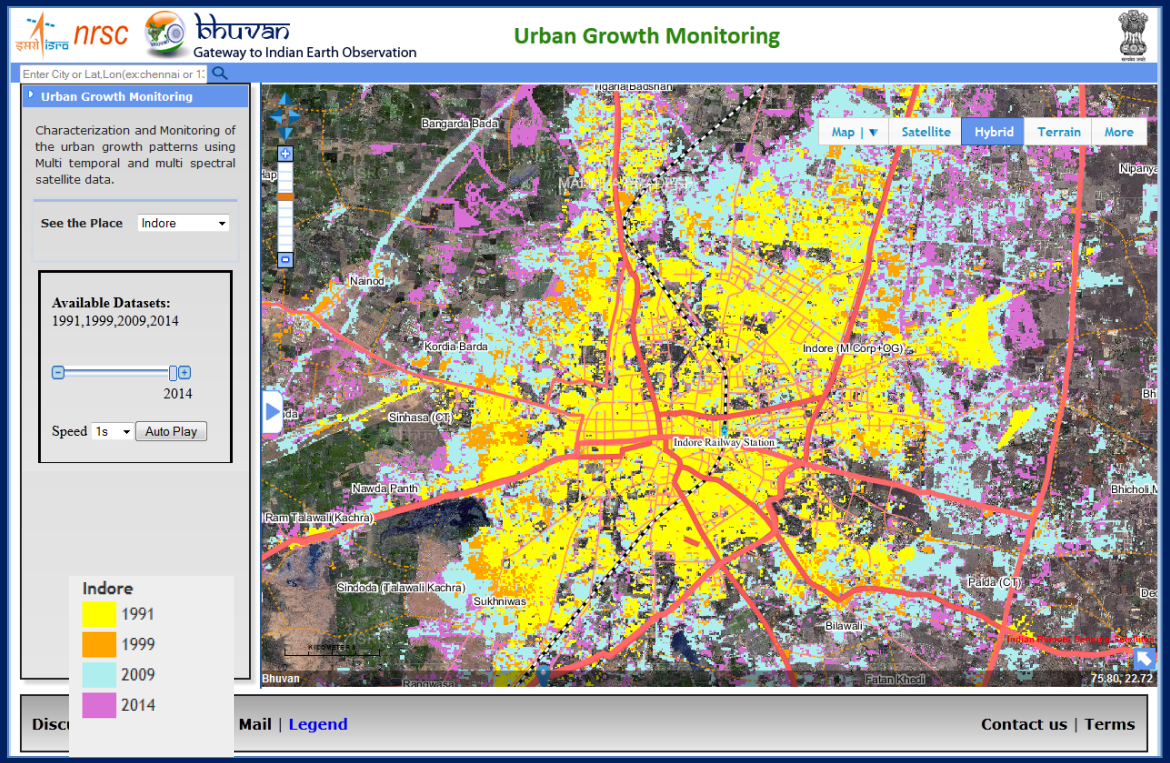
Bhuvan-National Urban Information System version 1.0.

Urban Growth

Characterization and Monitoring of the urban growth patterns using Multi temporal and multi spectral satellite data.

Salient Features

- DB driven framework which can be extended to any number of cities
- Incremental view of urban growth using the single service with dynamic control
- Applying the db driven dynamic color schema to the layer generated
- Animated view for growth monitoring of urban with the speed specified



City Details	
City/Town Name	Indore
Population(2011)	1960631
Category	Major Urbans
State	MADHYA PRADESH
More Detaills	

http://bhuvan.nrsc.gov.in/urban/sprawl/urbangrowth.php

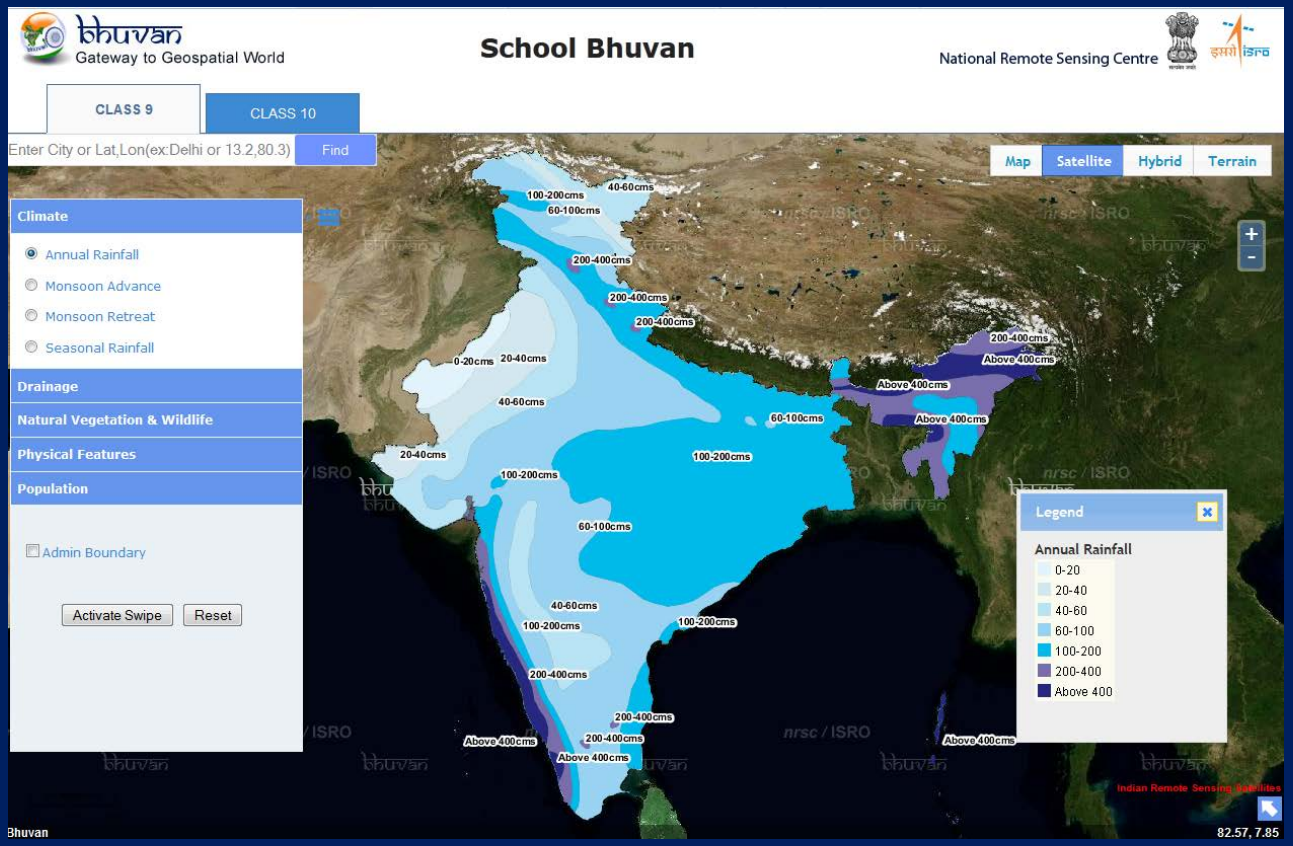
School Bhuvan

An e-learning portal for the students

A portal providing map based learning to bring awareness among the students about country's natural resources, environment and their role in sustainable development.

Salient Features

- Visualization of 9Th ,10th class maps of various categories (Agriculture, Water, Soil, Mineral etc) based on NCERT syllabus
- Provision to swipe the layers to know the ground reality
- Provision to take print the maps in PDF format



Future Plans

- Online Interactive quiz for both practice and exam
- On click Feature information

http://bhuvan-noeda.nrsc.gov.in/projects/schoolbhuvan/

Crowdsourcing/VGI using Mobile Apps on Smart Phones

Crowdsourcing/VGI for Disaster Management - MANU

Crowdsourcing/VGI basically allows the public to create and contribute geospatial facts of the field which specify both spatial and non spatial properties of particular location. This is made feasible with the help of field – based mobile GIS which uses mobile communication networks and the internet as the communication medium for mobile spatial information service framework.

Map the Neighbourhood in Uttarakhand

MANU

A DST Initiative

Indian Institute of Remote Sensing (IIRS)

&

National Remote Sensing Centre (NRSC)

&

Survey of India (SOI)

इसरो isro

Department of Science & Technology
Ministry of Science & Technology

Primary Mode of Field Data Collection

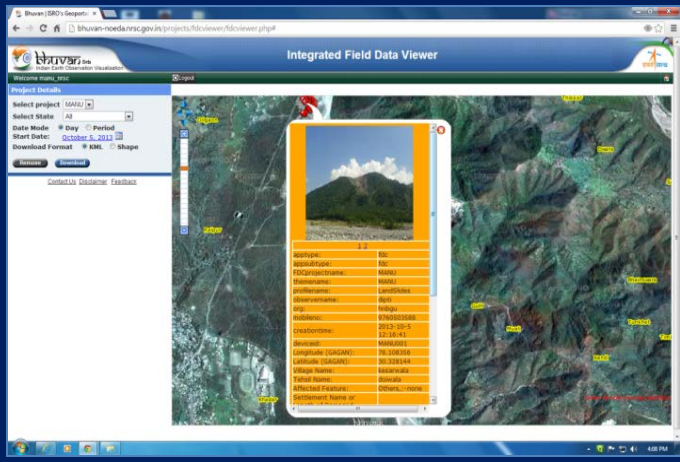
Bhuvan Portal

Consume Bhuvan Services

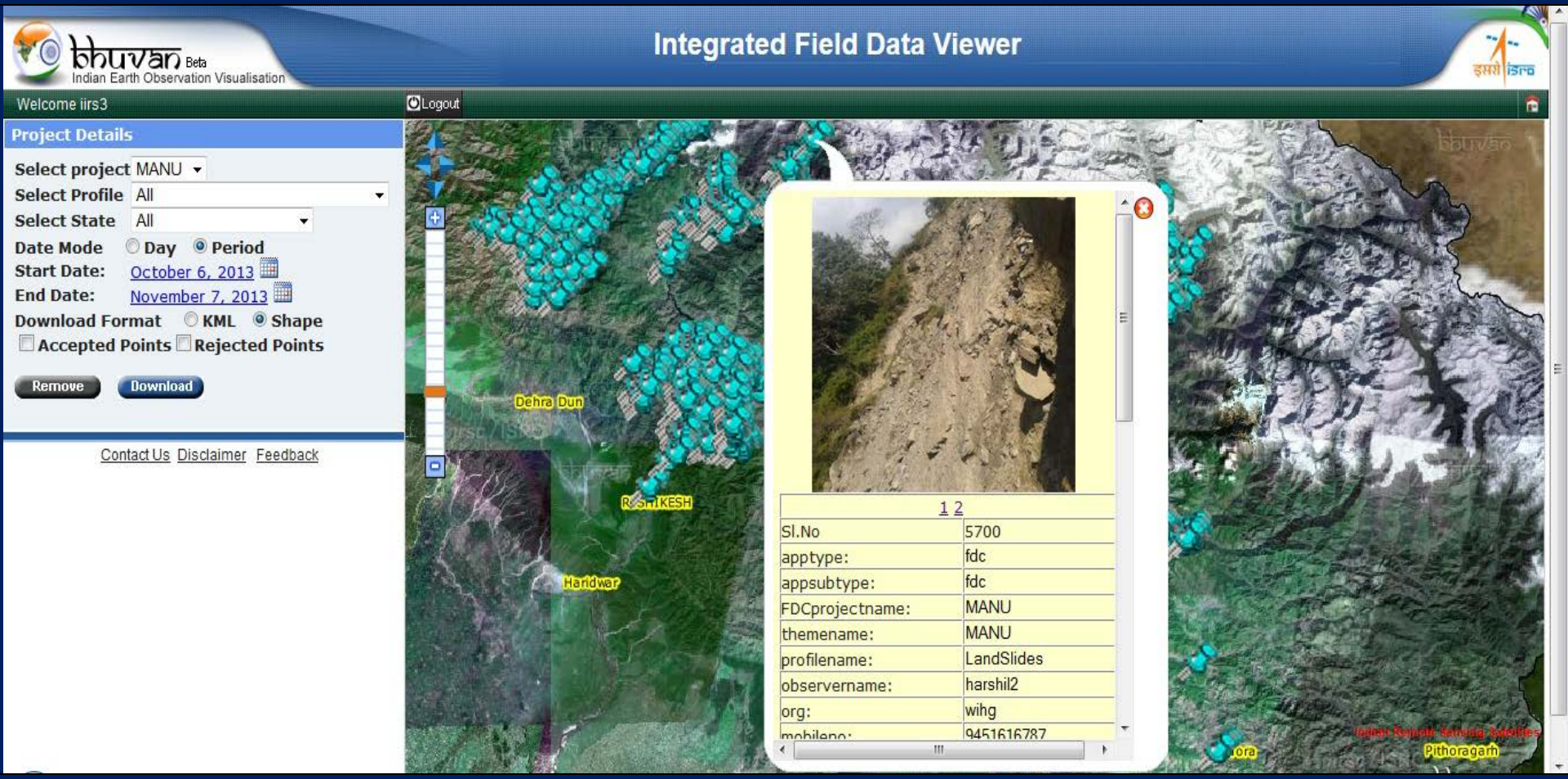
- Multi-sensor time-series satellite data;
- Satellite data Download;
- Thematic Services;
- User response and discussions;
- VGI data and information;
- Terrain profile and other data and information services

Mobile Device with App

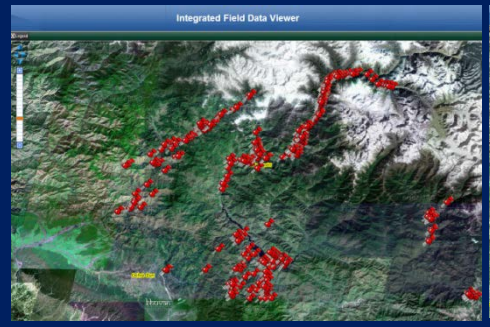
Visualisation on Bhuvan @ Client end



Visualization in Bhuvan

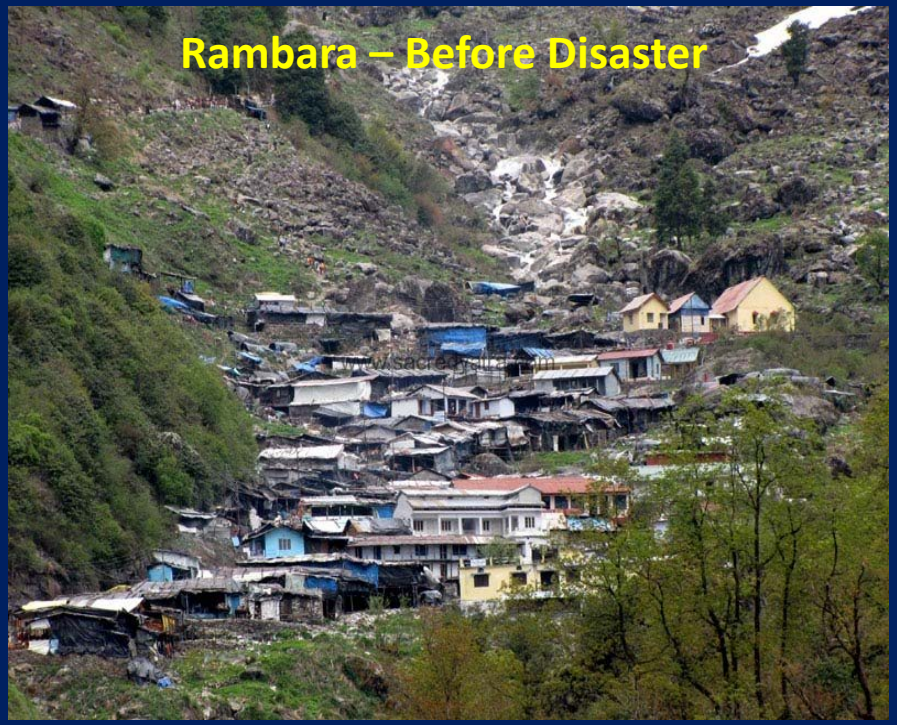


ProfileName: Damage to Buildings
No. of Points Collected: ~1000

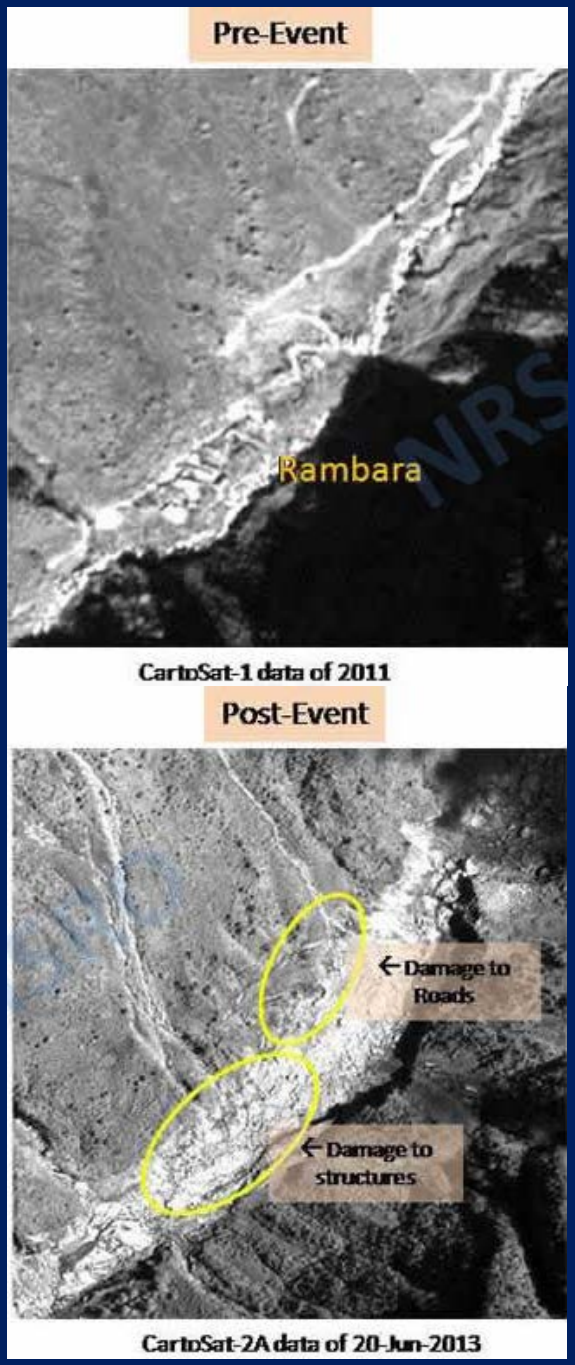


ProfileName: Damage to Roads
No. of Points Collected: ~460

ProfileName: Damage to Bridges OR Curvlets
No. of Points Collected: ~50



(courtesy: Garhwal University)



(courtesy: NRSC)

Crowdsourcing (Controlled/Public) +additional POIs ~ 3.8 Million

AP State Housing Corporation	3647169
NCFC-Crop	14238
MANU *(Mapping the Neighborhood in Uttarakhand)*	20228
HUDHUD	25665
Panchayat Assets	2636
IWMP	6725
BhuvanPOI (Controlled)	308
KFDPOI *(Karnataka Forest Department)*	615
Sub-Total	**3717584**

Controlled Crowdsourcing – Mobile Application

ECI Polling Station Location	69014
LULC	14316
Sub-Total	**83330**

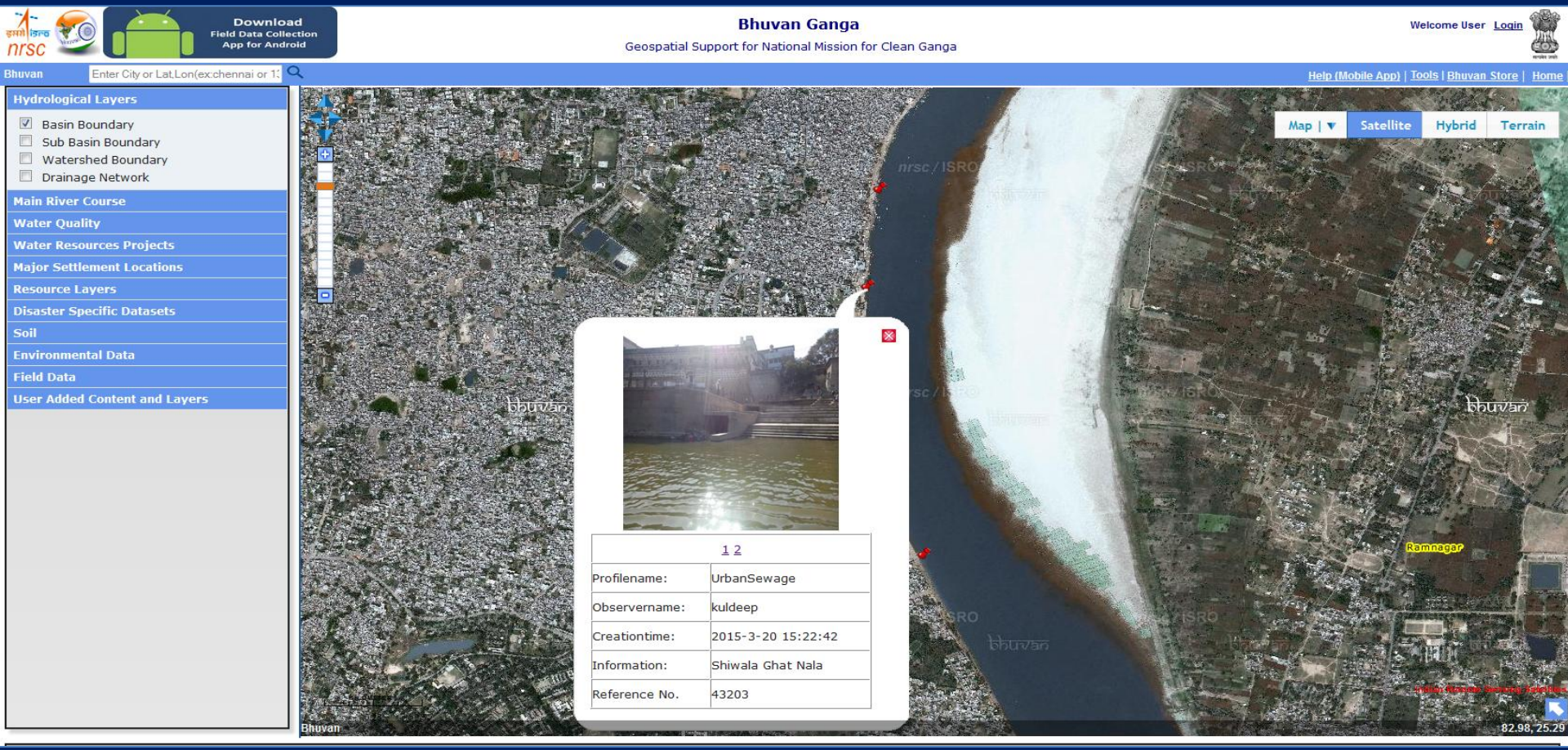
Additional POIs

Add Content (right click)	2567
Bhuvan POI (Public – Mobile app)	4554
Sub-Total	**7121**

Public Crowdsourcing

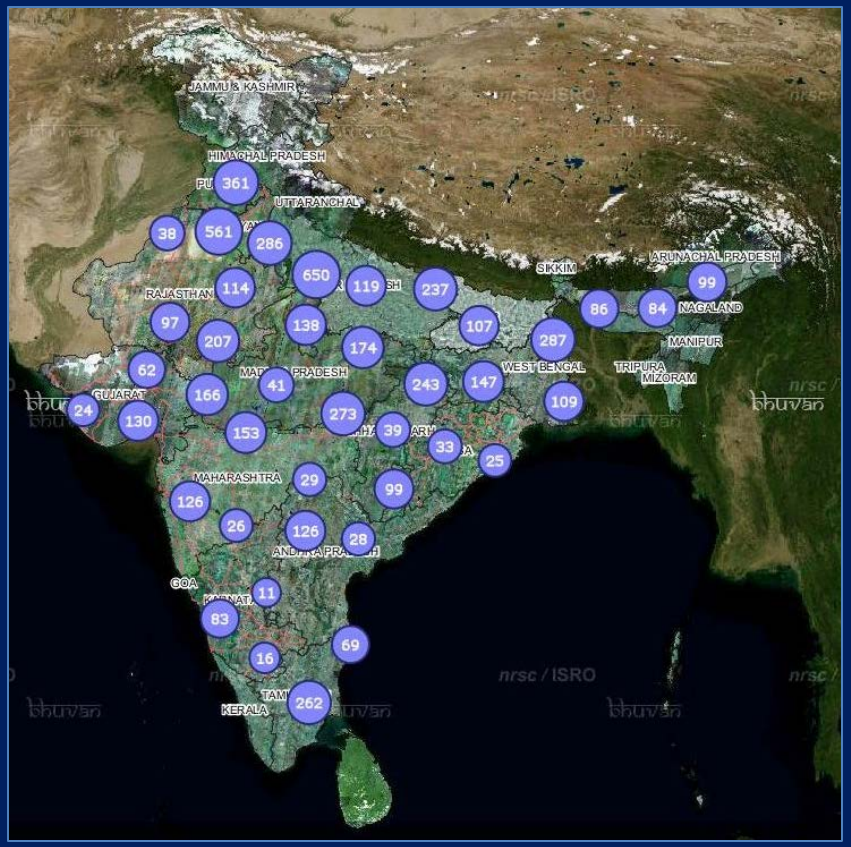
Bhuvan: Point of Interest, BhuvanPOI_v1.1 Android App allows mapping in an easy and intuitive Manner using smart phones. - **http://bhuvan3.nrsc.gov.in/bhuvanapp/bhuvanpoi_v11.php**

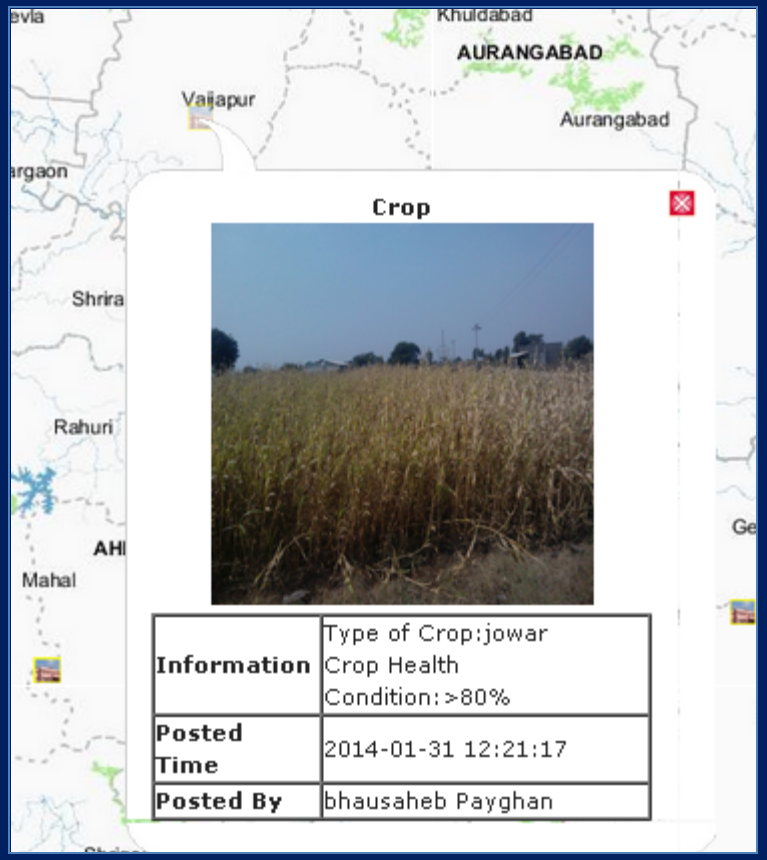
Bhuvan – Ganga Portal



"Platform for crowd sourcing to monitor pollution in river Ganga and enable decision makers to prioritize interventions by enabling public to collect and report information on various pollution sources that affects the water quality of river Ganga"

Mahalanobis National Crop Forecast Centre

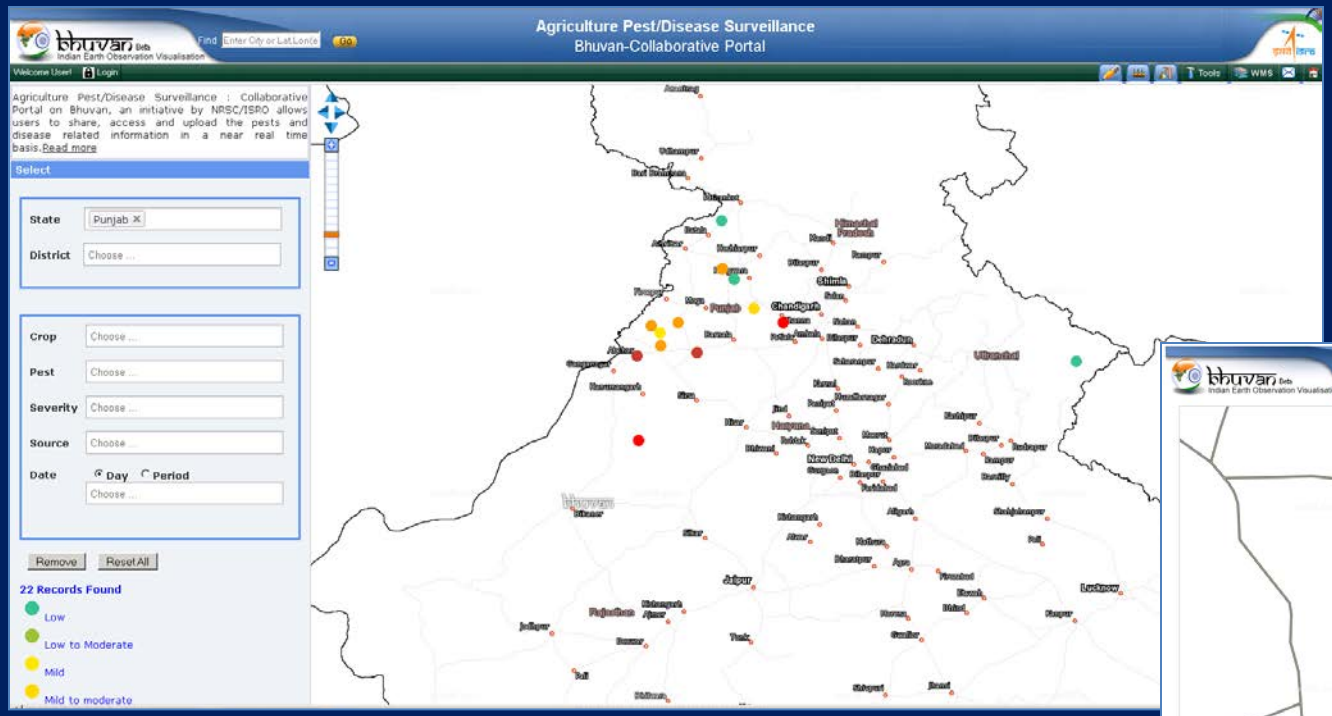


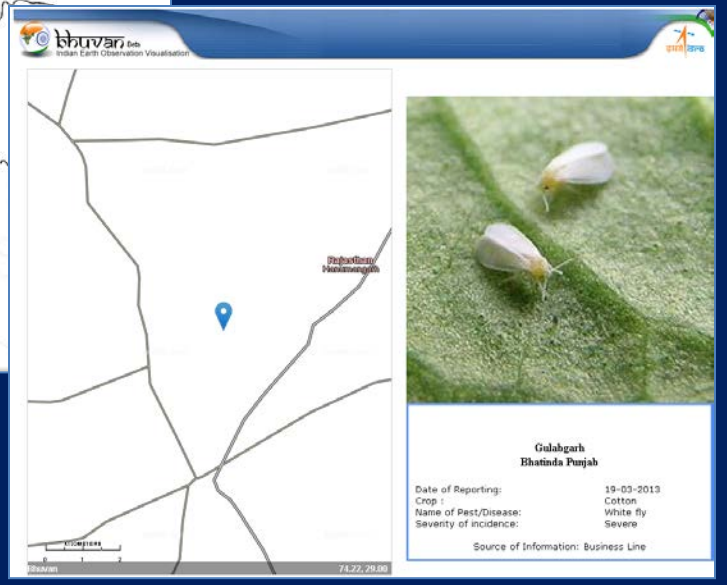


Bhuvan Android App allows mapping in an easy and intuitive Manner using smart phones.

Field Data Collection on various parameters on Crop
“for Decision Making”

Agriculture Pest / Disease Surveillance System



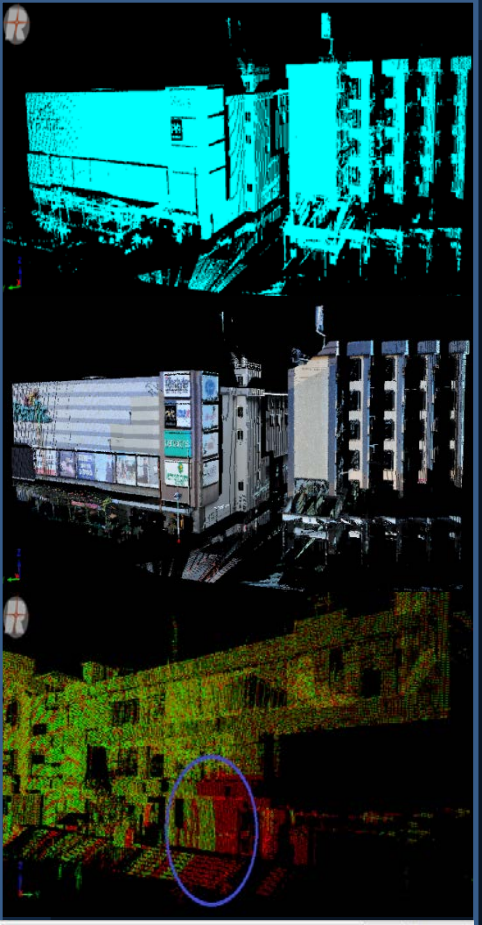


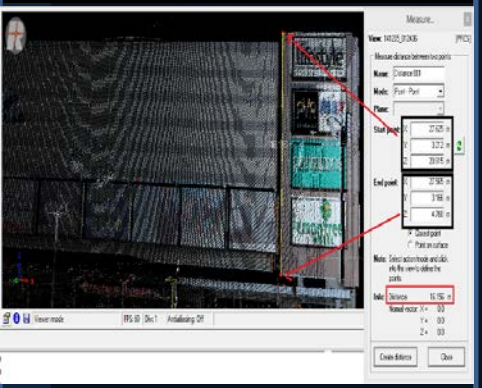
"Collaborative Portal allowing users to share, access and upload the pests and disease related information"

Single Window System for **information collection** and sharing **expert knowledge**.

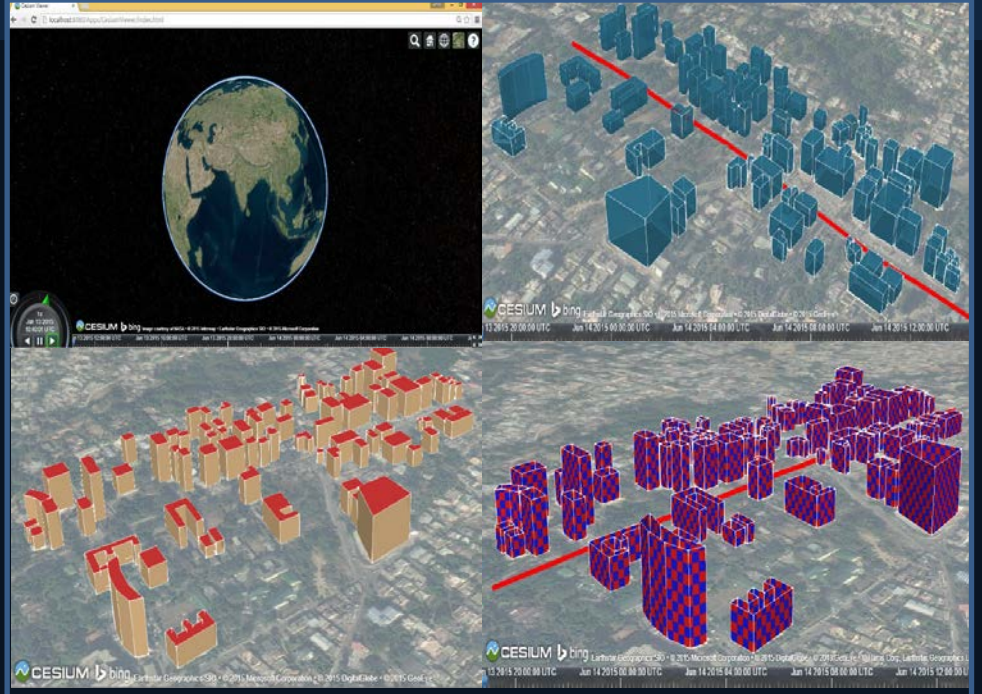
Other Case Studies

- 3D GIS model
- Traffic Noise Modeling
- Solar Mapping
- Monitoring Land use/ Land cover
- Taxation
- Tourist
- Water Supply/Electricity Supply-
  - Facility/Utility Mapping

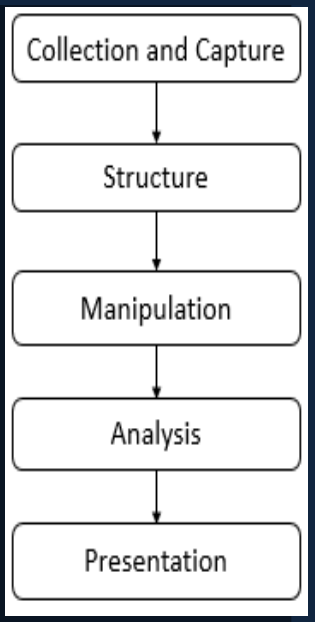




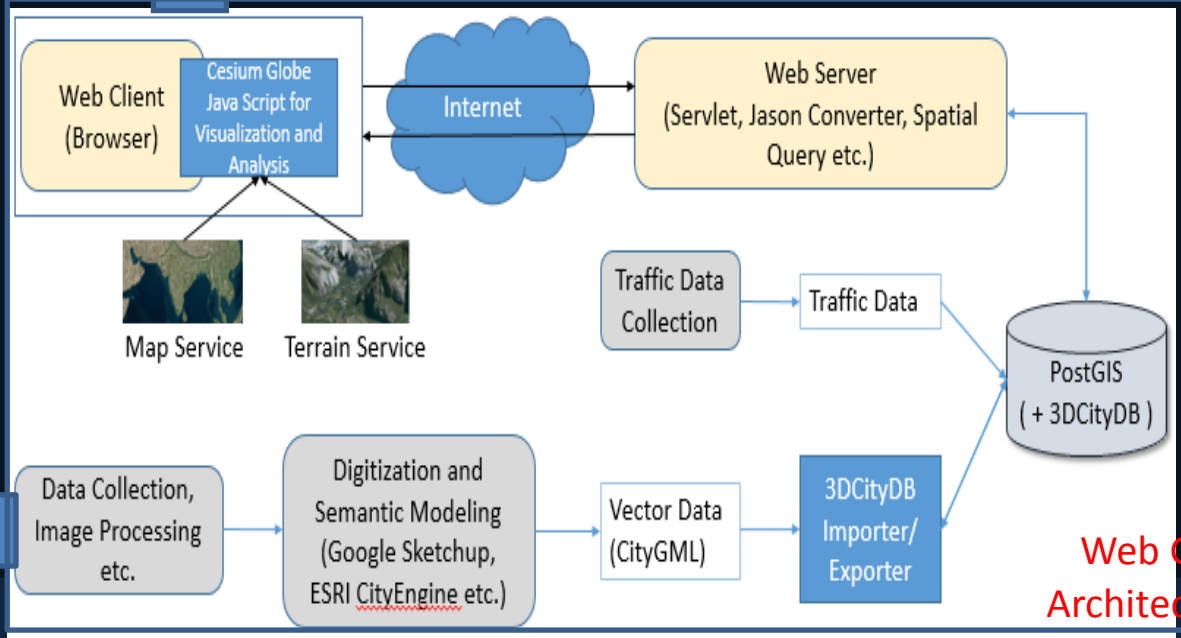
3D Data Collection And Processing



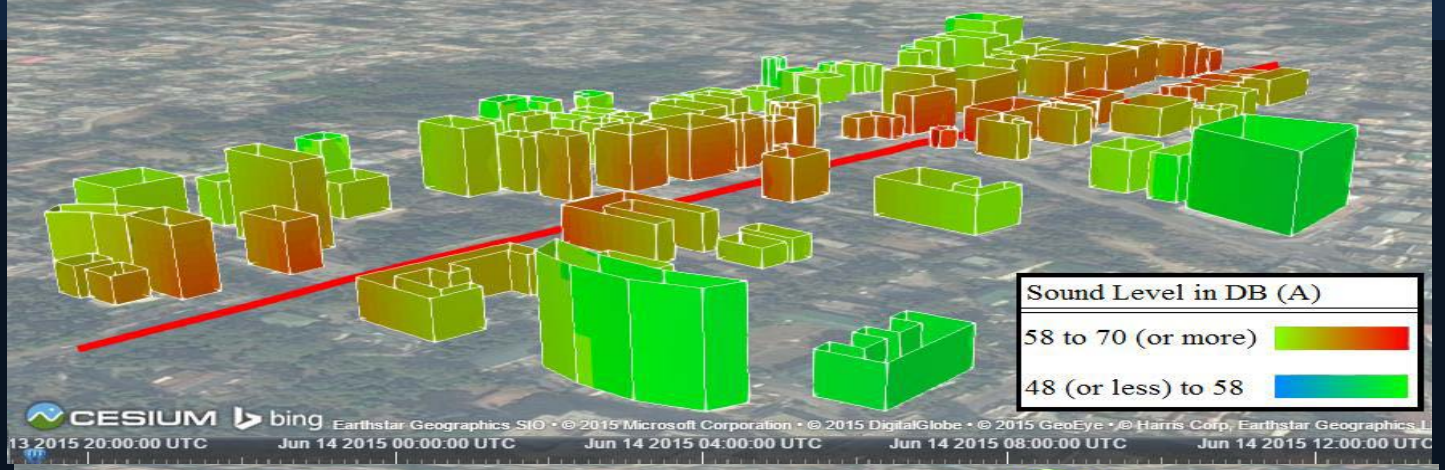
Presentation/Visualization

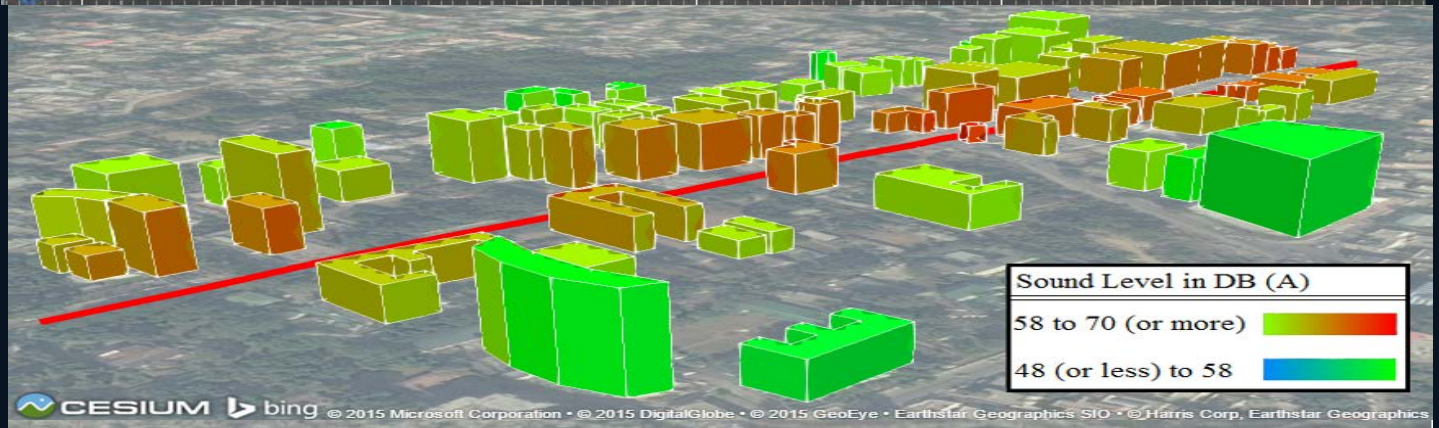


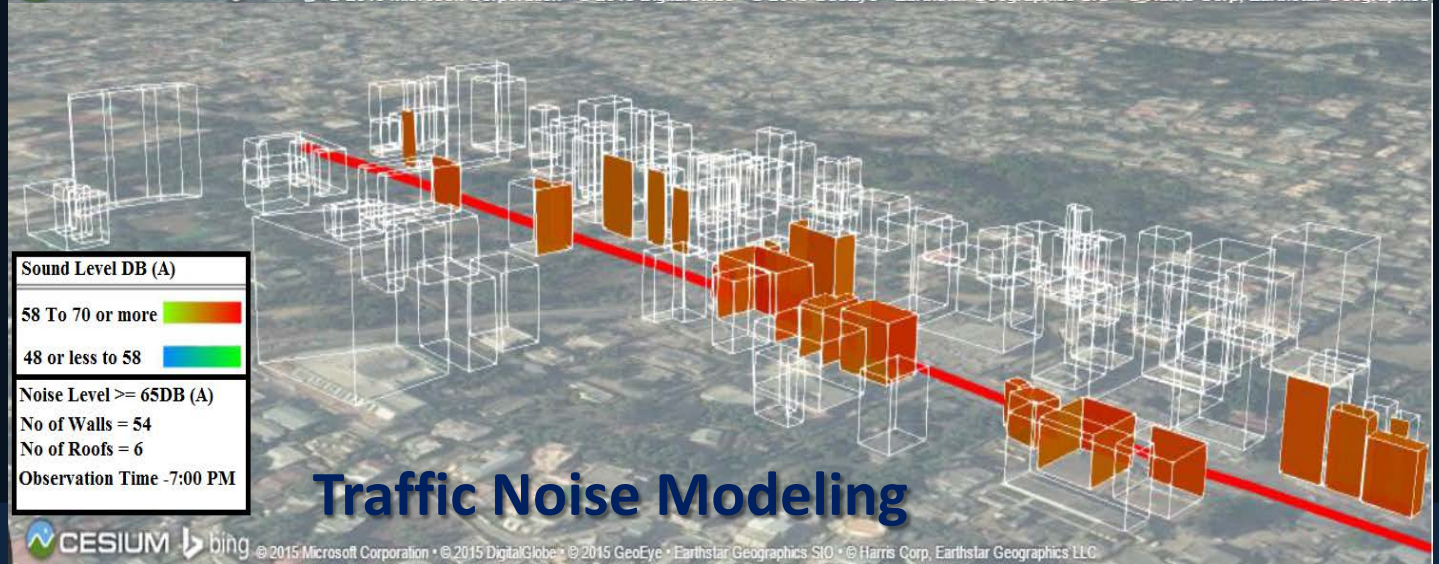
GIS FUNCTIONS



Web GIS Architecture







Traffic Noise Modeling

Geospatial Modelling

3D City Modelling for harnessing Solar Energy to develop Solar Cities

- To estimate effective percentage of roof/wall/window of a building contribute to harness solar energy
- To simulate solar heat potentials of buildings on monthly/daily or hourly basis considering sun-earth geometry

End use

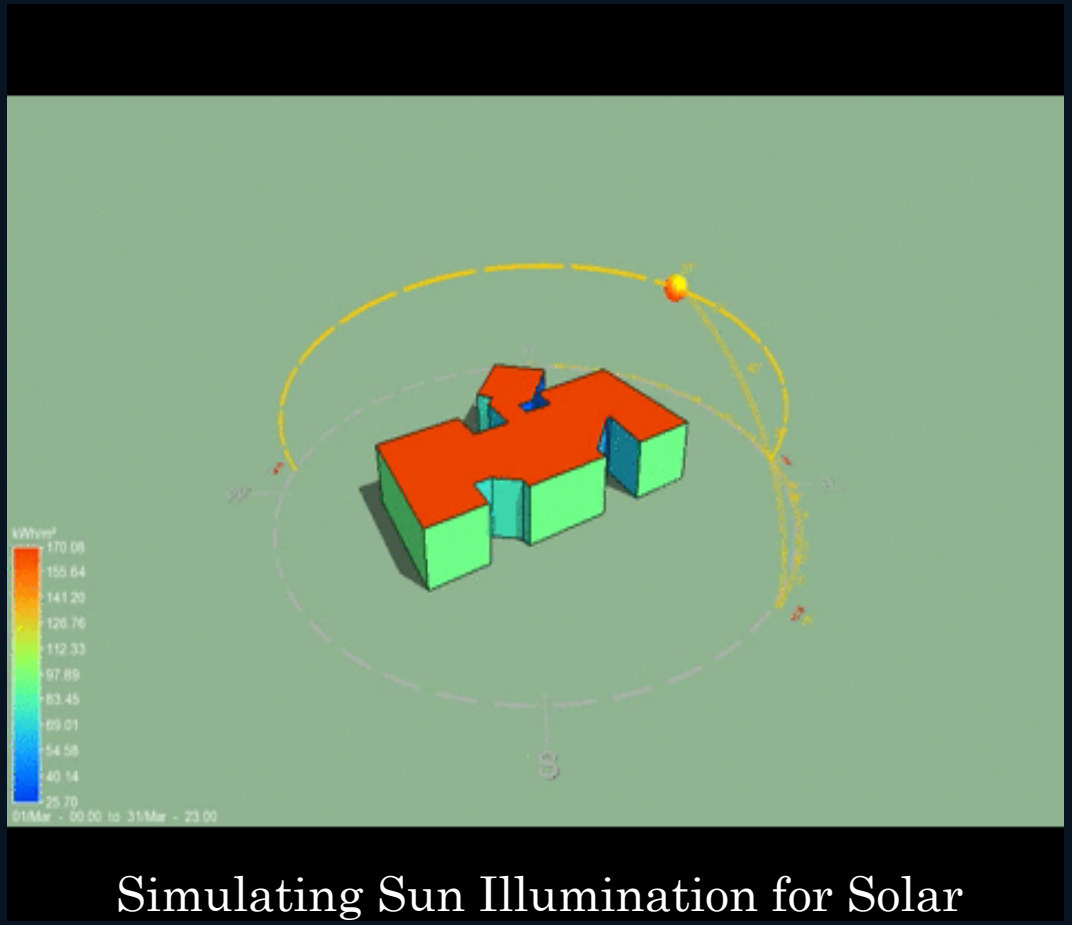
- Urban energy demand modelling for solar cities
- Ministry of New & Renewable Energy

Details

- CARTOSAT - 2A data for building footprints
- 3D Building model Generation

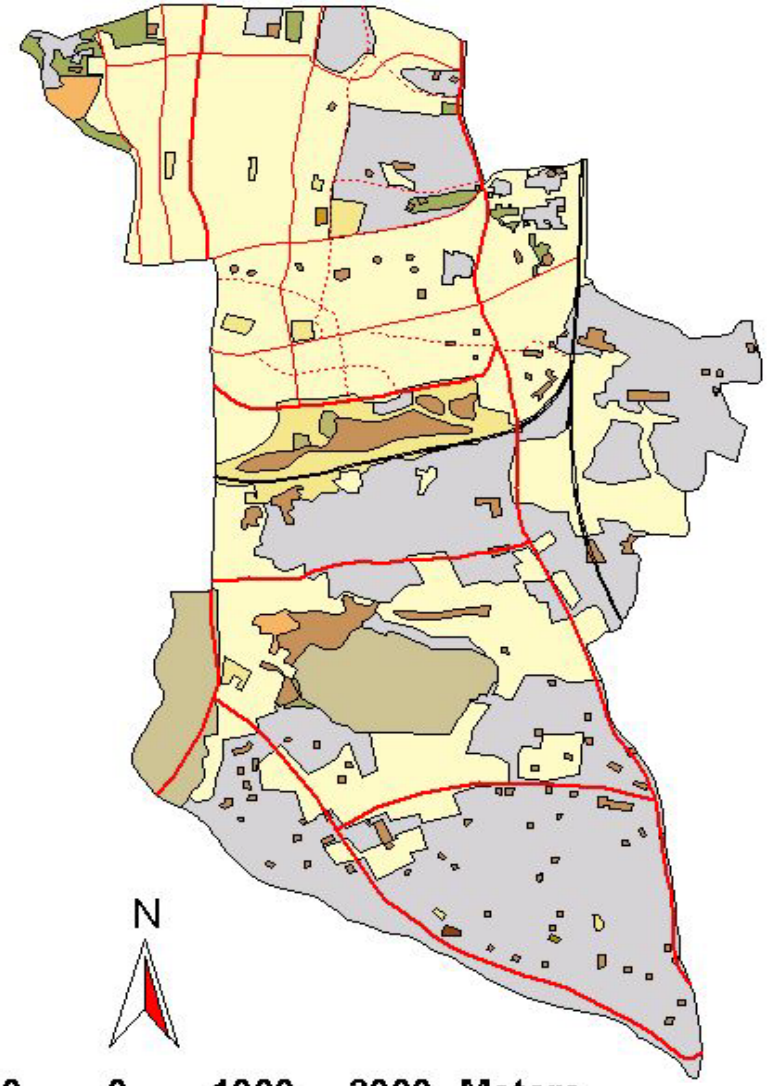
3D Building Model generation

Semantic Dissection of 3D Model



Simulating Sun Illumination for Solar Energy estimation

LAND USE / LAND COVER MAP OF BOROUGH NO. VIII & X KOLKATA - 1960



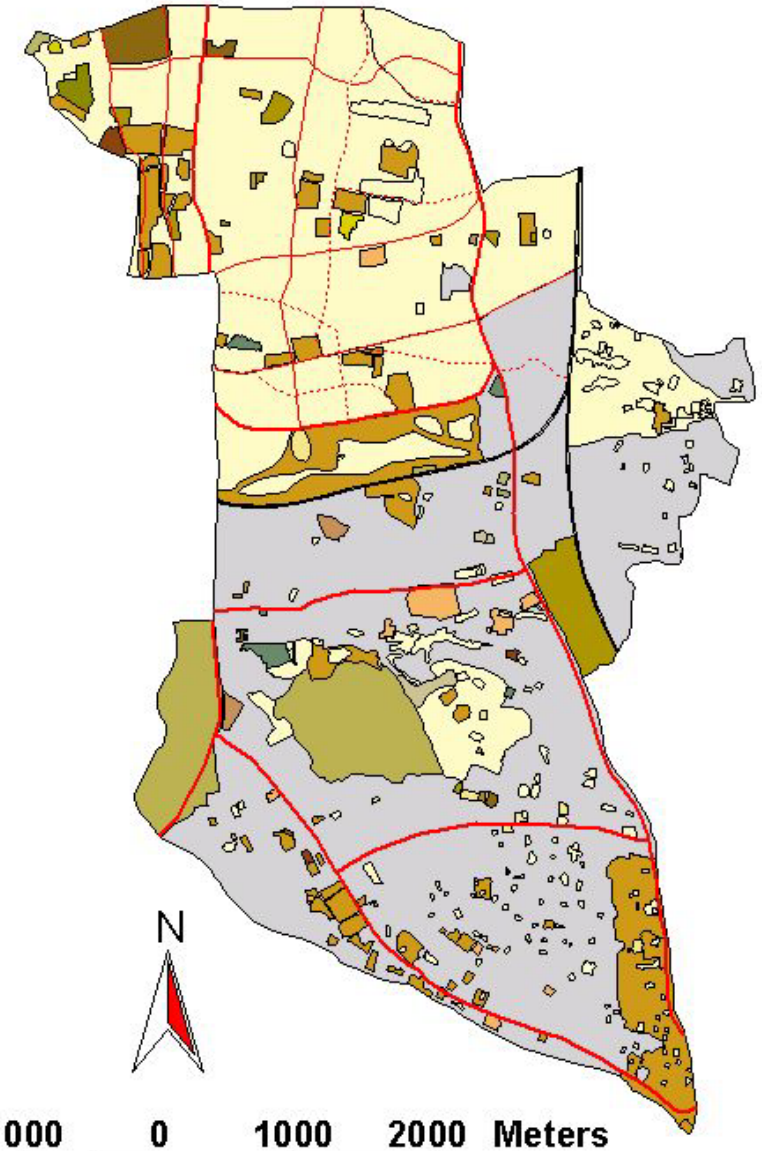
N

1000 0 1000 2000 Meters

LEGEND

- Sparsely Built-up Area
- Very Sparsely Built-up Area
- Public/Semi Public Uses
- Cemetry/Burial Ground
- Clubs/Golf Course
- Playground/Stadium
- Parks/Open Spaces
- Vacant Land
- Water Body/Marshy Land
- Commercial Area
- Others
- Major Road
- Minor Road
- Narrow Road
- Railway Line

LAND USE / LAND COVER MAP OF BOROUGH NO. VIII AND X KOLKATA - 1980

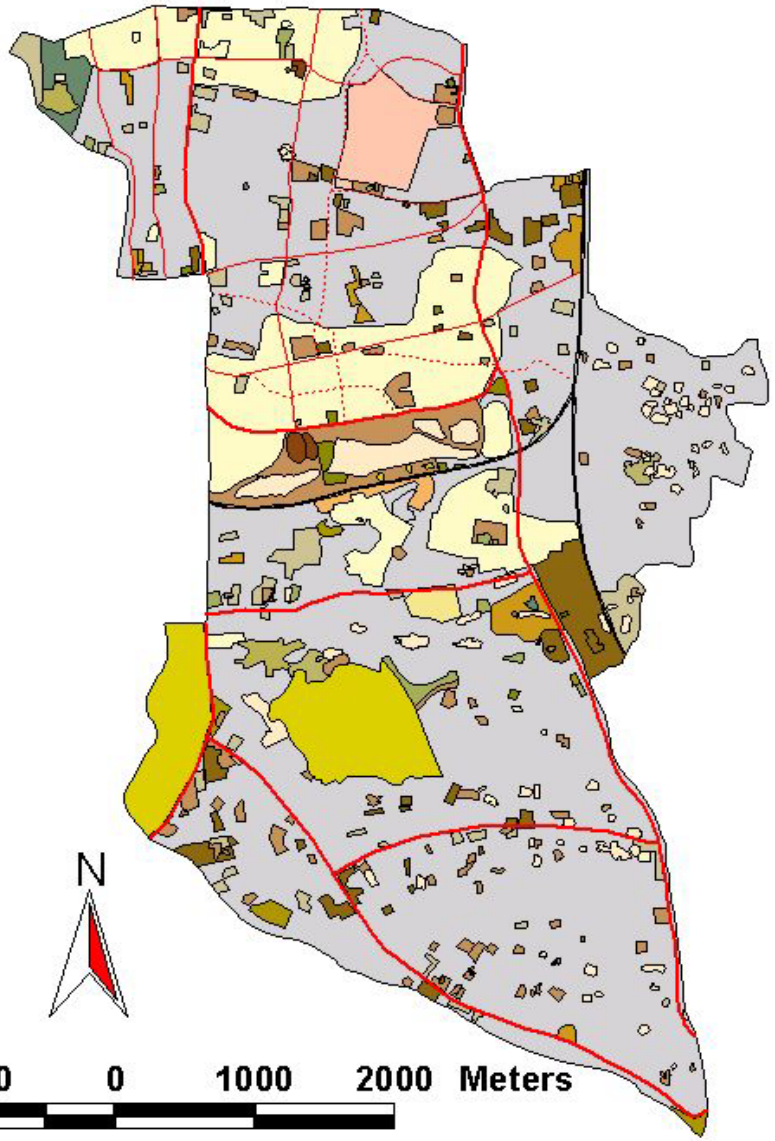


LEGEND

- Densely Built-up
- Sparsely Built-up
- Commercial Area
- Industrial Area
- Public/Semi Public Uses
- Parks/Open Spaces
- Playground/Stadium
- Administrative Area
- Bus Depot/Bus Stand/Tram Depot
- Govt. Offices
- Educational/Institutional
- Cultural/Religious/Museum
- Hospital/Nursing Home/Dispensary
- Cemetery/Burial Ground
- Water Body/Marshy Land
- Clubs/Golf Course
- Others

- Major Road
- Minor road
- Narrow Road
- Railway Line

LAND USE / LAND COVER MAP OF BOROUGH NO. VIII & X KOLKATA - 1991

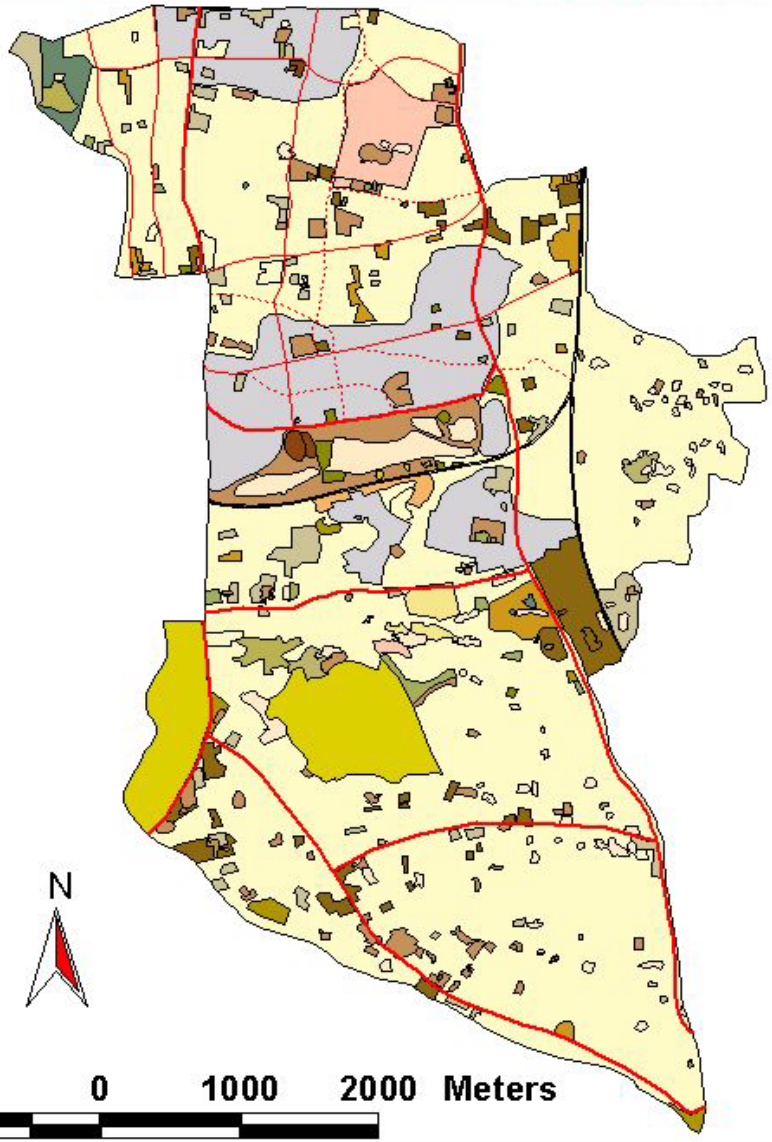


LEGEND

- Planned Residential Area
- Unplanned Residential Area
- Apartments
- Slums
- Commercial Area/Shopping Complex
- Industrial Area
- Defunct Industrial Area
- Public/Semi Public Uses
- Parks/Open Spaces
- Playground/Stadium
- Bus Depot/Bus Stand/Tram Depot
- Administrative Area/Govt. Office
- Educational/Institutional
- Cultural/Religious/Museum
- Hospital/Nursing Home/Dispensary
- Burial Ground/Cemetery
- Clubs/Golf Course
- Water Body/Marshy Land
- Others

- Major Road
- Minor Road
- Narrow Road
- Railway Line

LAND USE / LAND COVER MAP OF BOROUGH NO. VIII & X KOLKATA - 2001



LEGEND

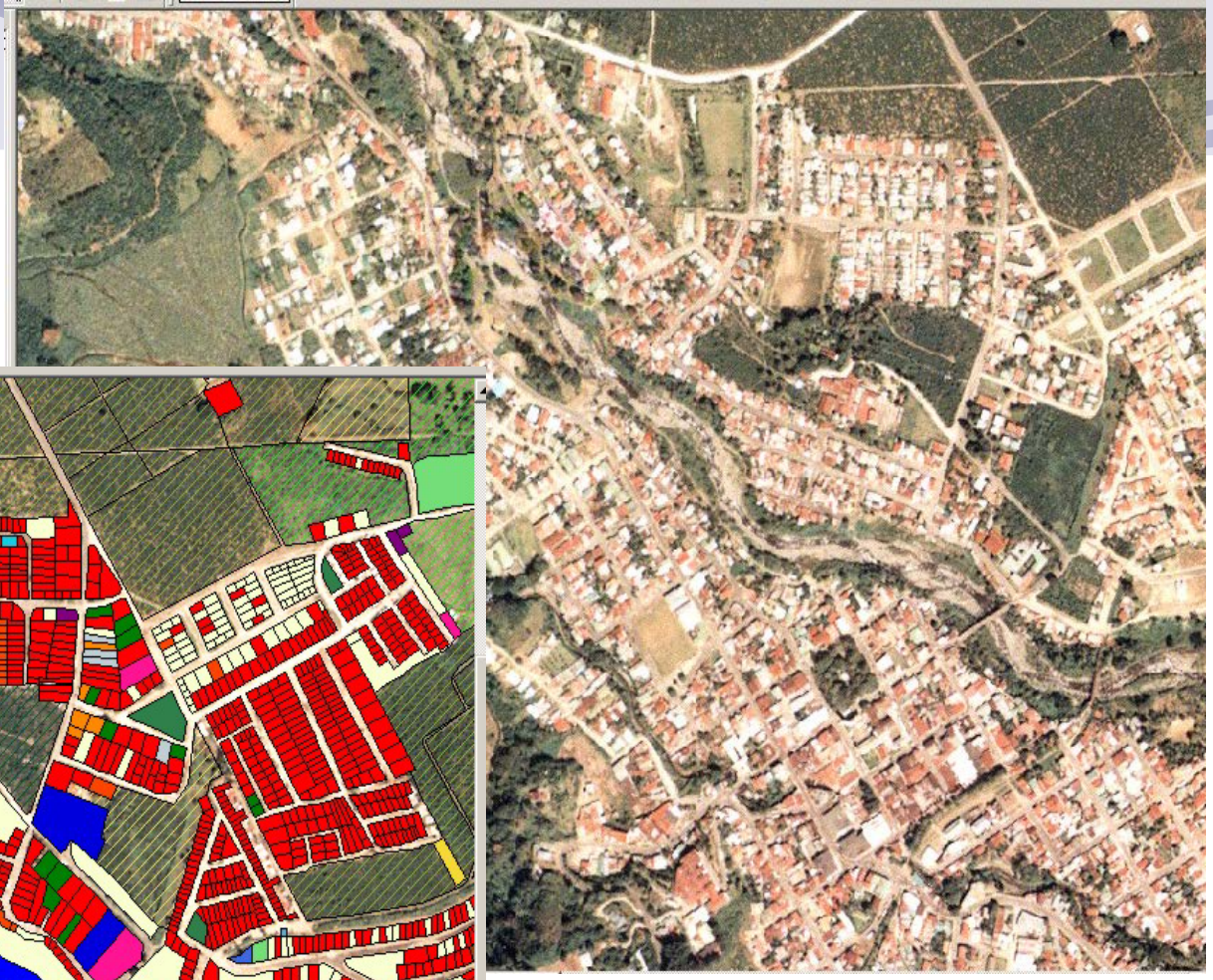
- Planned Residential Area
- Unplanned Residential Area
- Apartments
- Slums
- Commercial Area/Shopping Complex
- Industrial Area
- Defunct Industrial Area
- Public/Semi Public Uses
- Parks/Open Spaces
- Playground/Stadium
- Bus Depot/Bus Stand/Tram Depot
- Administrative Area/Govt. Office
- Educational/Institutional
- Cultural/Religious/Museum
- Hospital/Nursing Home/Dispensary
- Burial Ground/Cemetry
- Clubs/Golf Course
- Water Body/Marshy Land
- Others
- Major Road
- Minor Road
- Narrow Road
- Railway Line

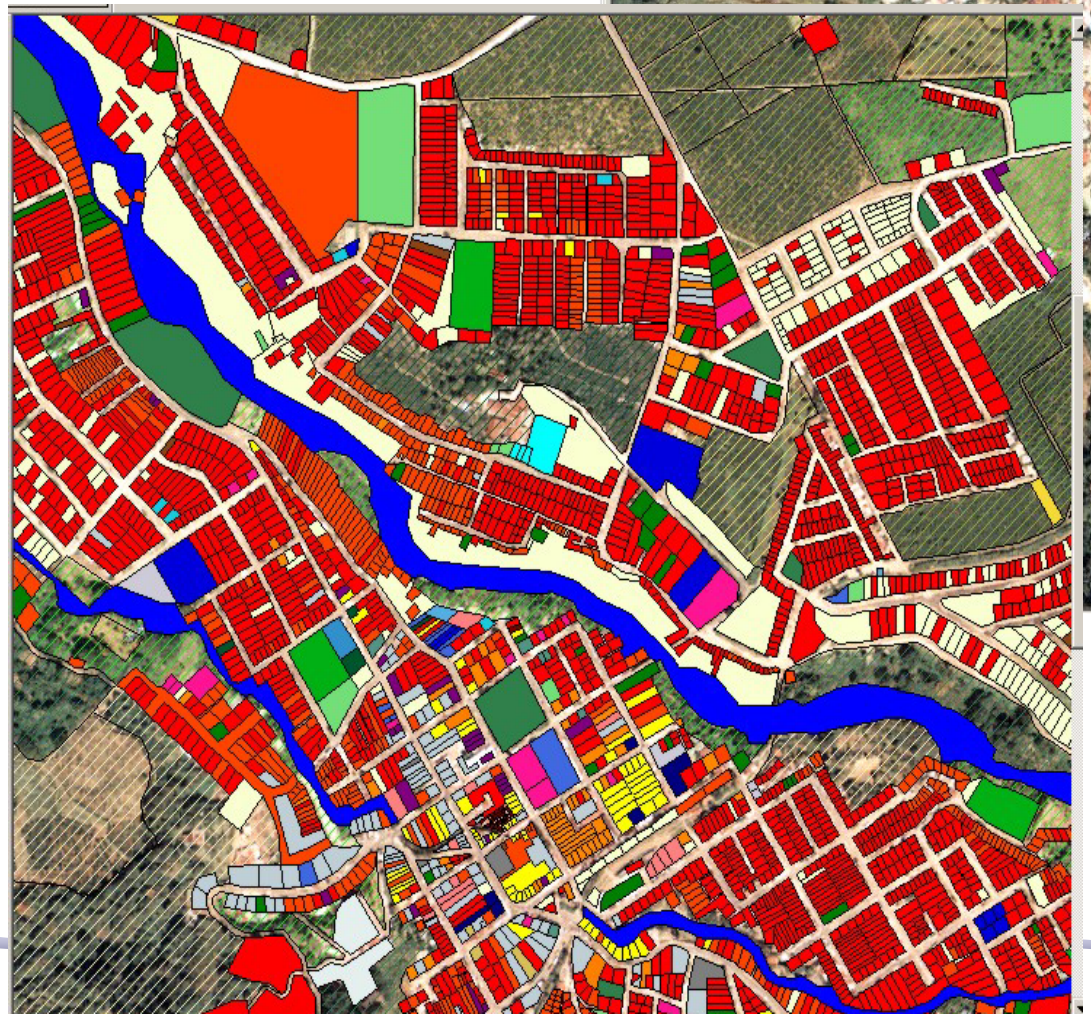
MUNICIPAL IMPOSTS

1. House Tax
2. Water Tax
3. Sewerage Tax
4. Conservancy Tax
5. Latrine / Scavenging Tax
6. Electricity Tax
7. FireTax

In actual practice the composition and scope of these various imposts are observed to vary from one state's municipality to another and between one country to other.

Remote sensing

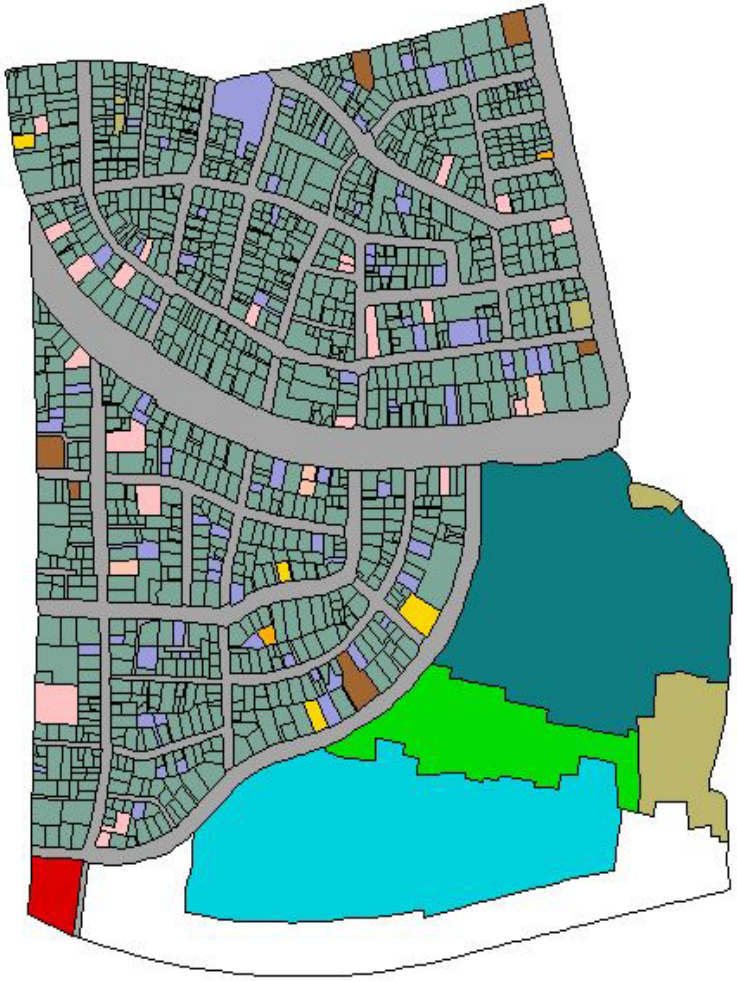




GIS

LAND USE/ LAND COVER MAP OF WARD 87

BOROUGH VIII MUNICIPALITY, KOLKATA



N

LEGEND

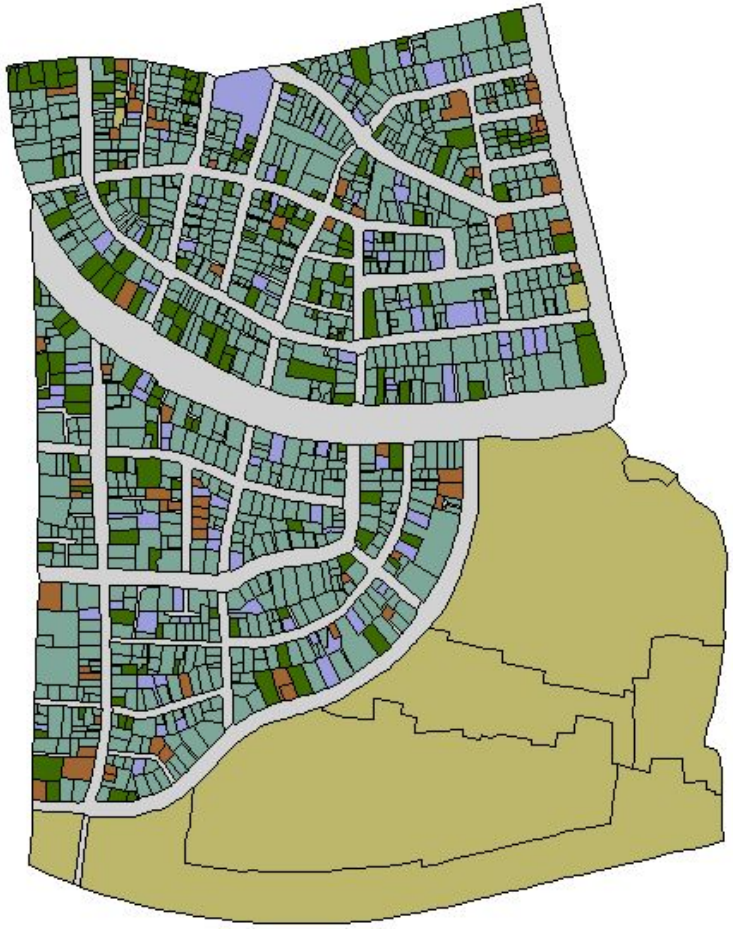
- RESIDENTIAL
- COMMERCIAL
- INSTITUTIONAL
- CULTURAL
- GOVERNMENT OFFICE
- PRIVATE OFFICE
- HOSPITAL
- OPEN SPACE
- PARK
- RELIGIOUS
- STADIUM/ PLAYGROUND
- LAKE
- DATA NOT AVAILABLE
- ROAD

100 0 100 200 300 400 Meters

DATA SOURCE : CMC, W.B.

LAND OWNERSHIP/ RENTAL MAP OF WARD 87

BOROUGH VIII MUNICIPALITY, KOLKATA



LEGEND

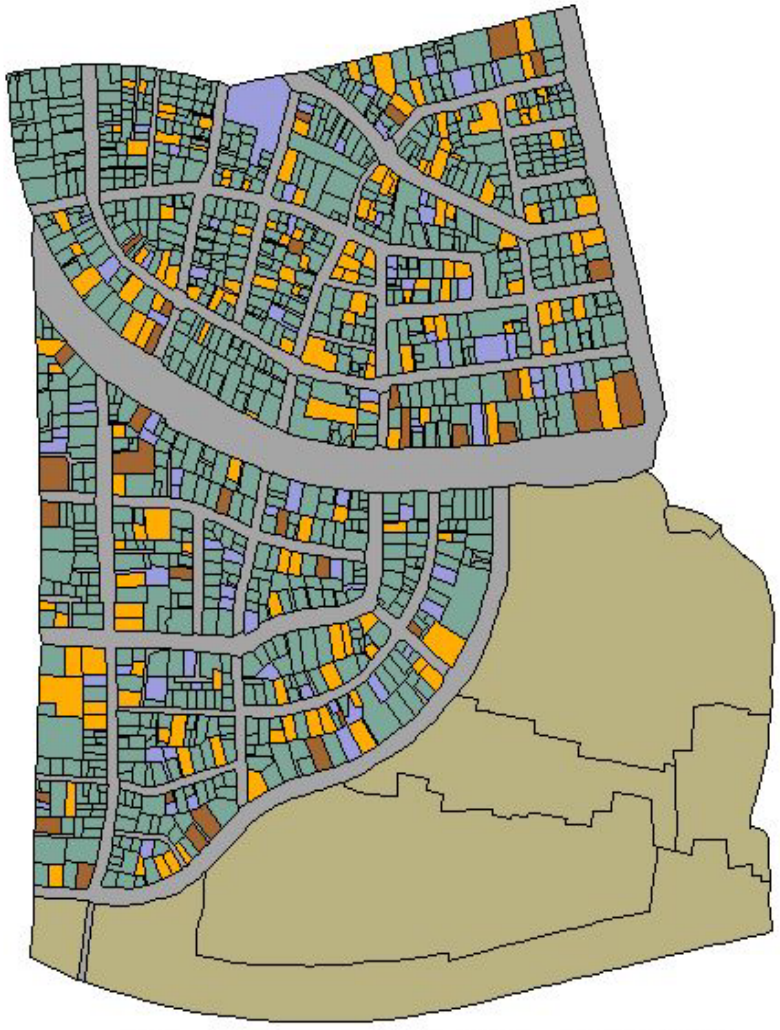
- OWNERS SELF OCCUPIED
- RENTAL
- GOVERMENT LAND
- NOT USED BY OWNERS
- DATA NOT AVAILABLE
- ROAD

66 PLOTS ARE IDENTIFIED AS "NOT USED BY OWNERS". THIS PLOTS ARE REGISTERED AS SELF BUT ACTUAL USE OF THIS PLOTS ARE RENTAL.

DATA SOURCE : CMC,W.B.

PARCEL BASED FAMILY CLUSTER MAP OF WARD 87

BOROUGH VIII MUNICIPALITY, KOLKATA



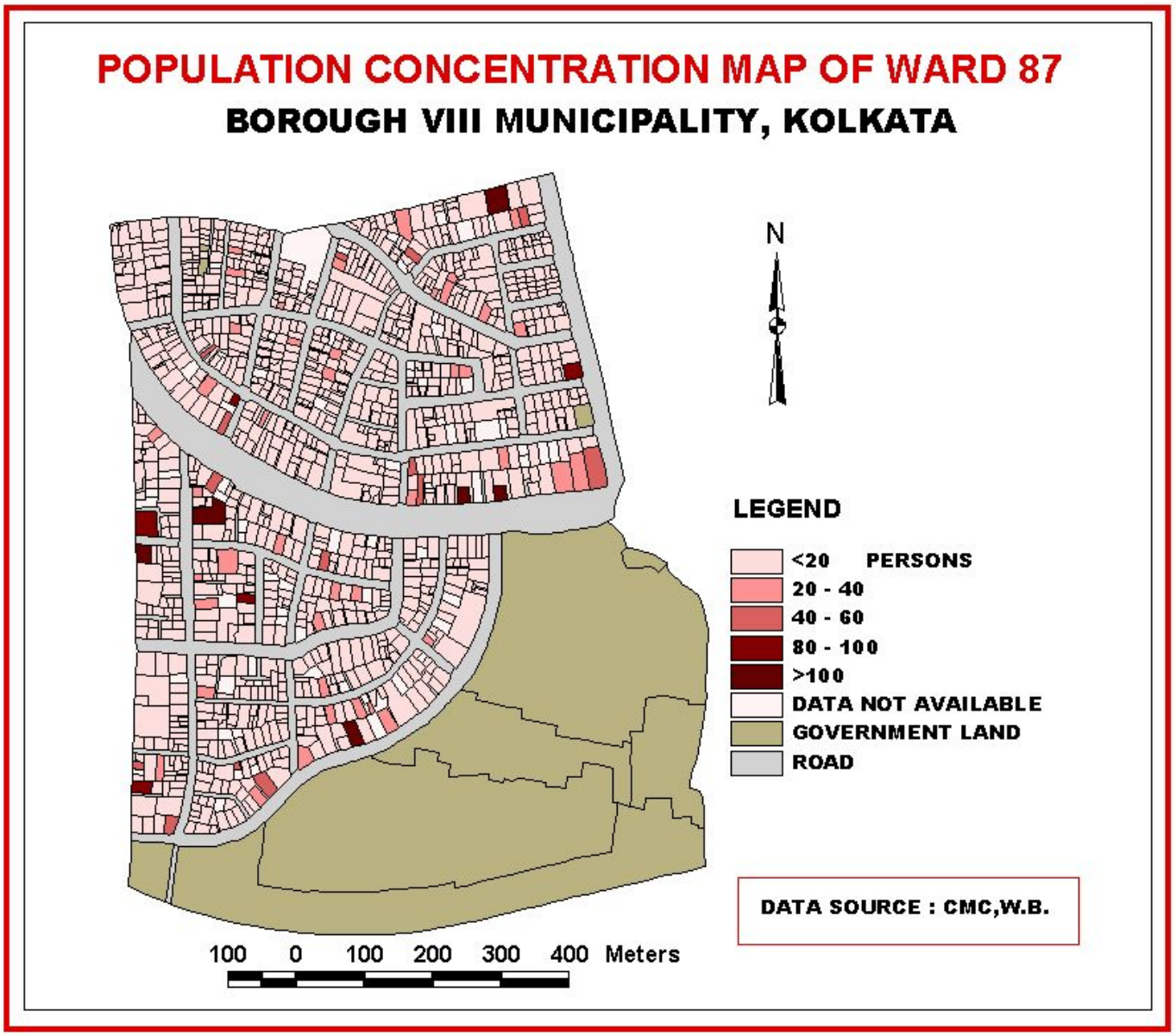
N

LEGEND

- SINGLE FAMILY ACCOMODATION
- 2 - 6 FAMILY ACCOMODATION
- >6 FAMILY ACCOMODATION
- GOVERNMENT LAND
- DATA NOT AVAILABLE
- ROAD

100 0 100 200 300 400 Meters

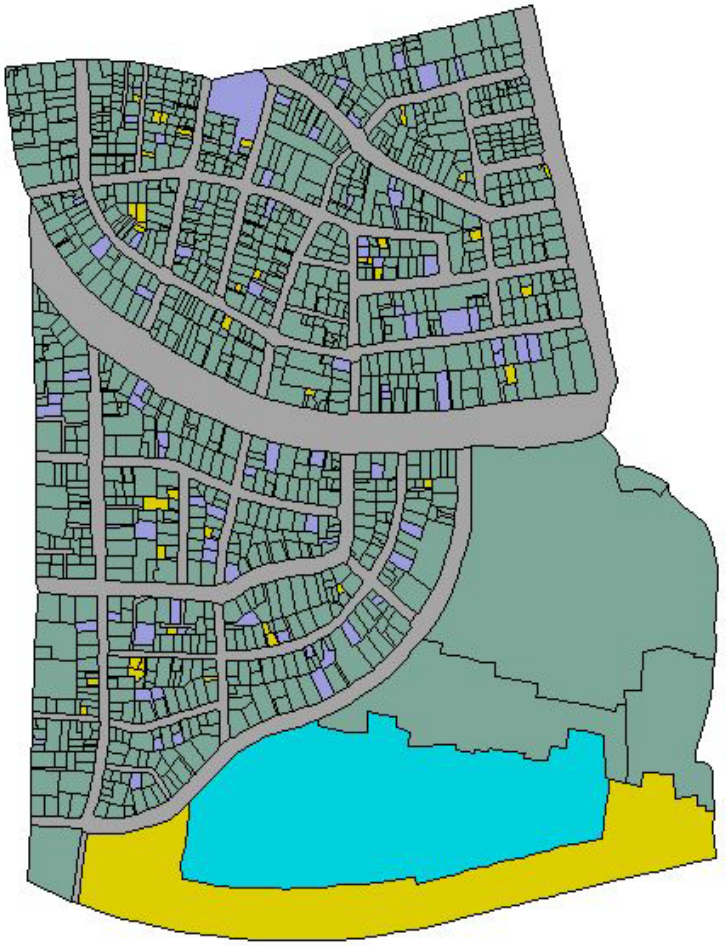
DATA SOURCE : CMC,W.B.



REVENUE EARNED 51%, 14%, 9% 7% &18% FROM RESPECTIVE CLASSES

ELECTRIC SUPPLY MAP OF WARD 87

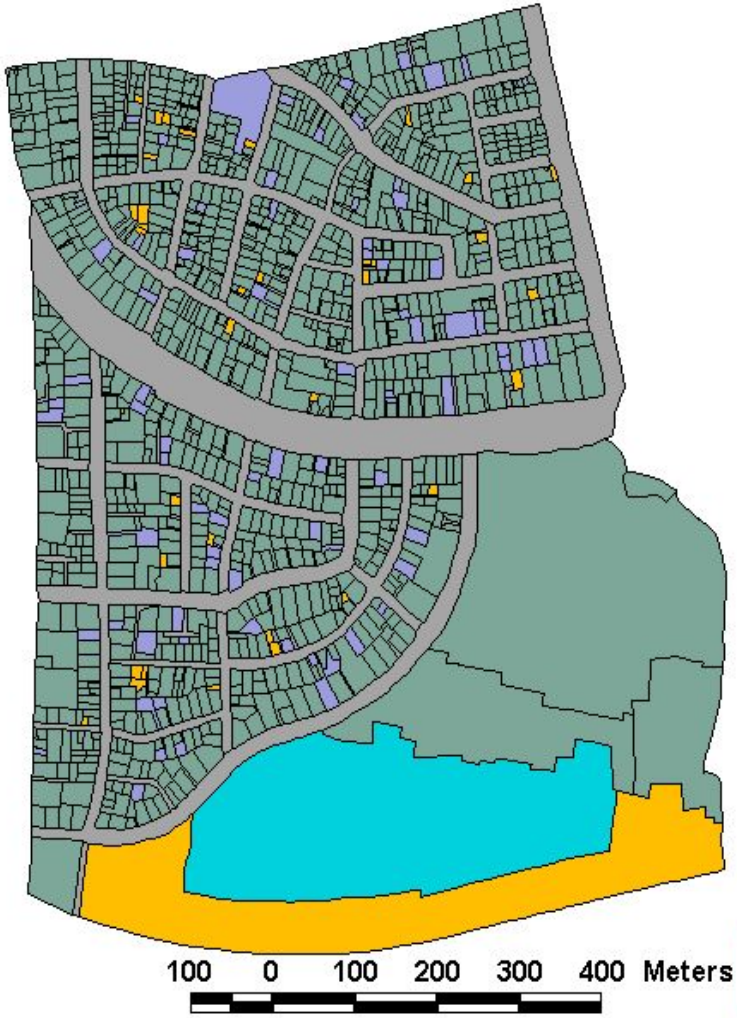
BOROUGH VIII MUNICIPALITY, KOLKATA



DATA SOURCE : CMC, W.B.

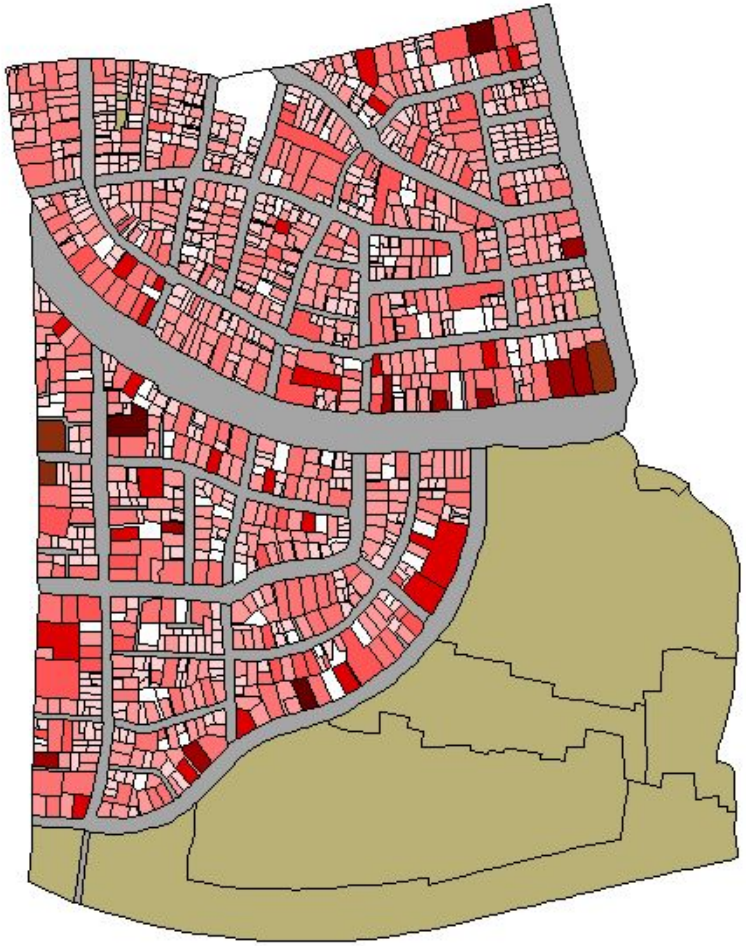
WATER SUPPLY MAP OF WARD 87

BOROUGH VIII MUNICIPALITY, KOLKATA



TAX ZONATION MAP OF WARD 87

BOROUGH VIII MUNICIPALITY, KOLKATA



N

LEGEND

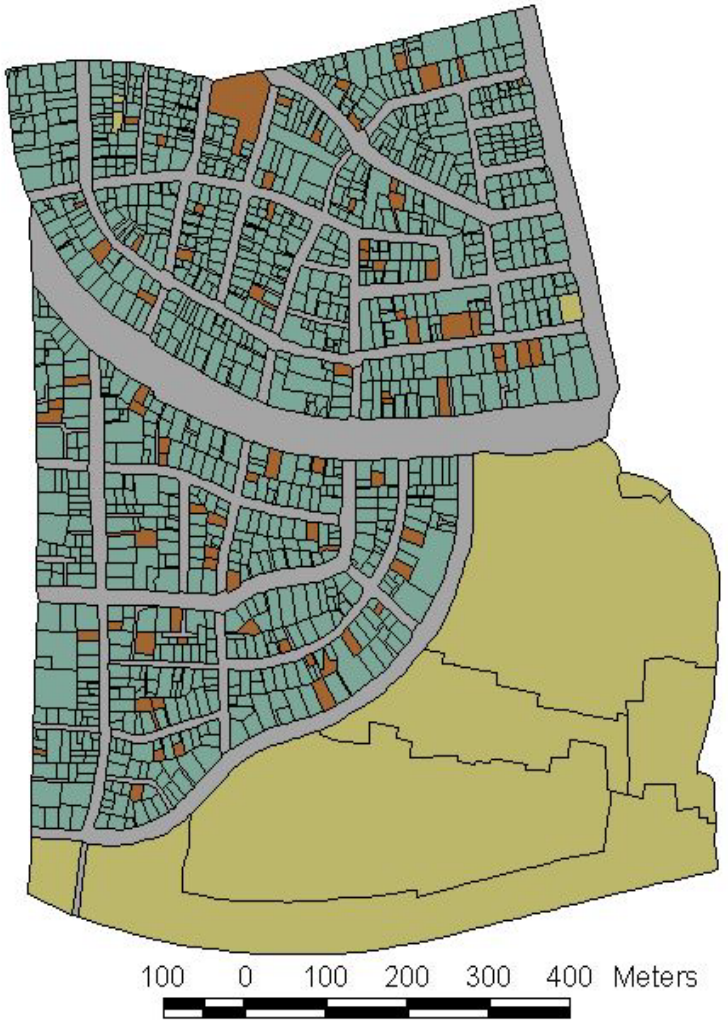
- LESS THAN Rs.1000
- Rs. 1000 -2000
- Rs. 2001 -5000
- Rs. 5001-10000
- Rs. 10001 -20000
- Rs.20001 -50000
- Rs. 50001 -100000
- MORE THAN Rs. 100000
- DATA NOT AVAILABLE
- GOVERNMENT LAND
- ROAD

CUMULATIVE REVENUE IS GENERATED FROM EACH PARCEL BASED ON REVENUE RECORD

100 0 100 200 300 400 Meters

TAX DEFAULTER'S MAP OF WARD 87

BOROUGH VIII MUNICIPALITY, KOLKATA



LEGEND

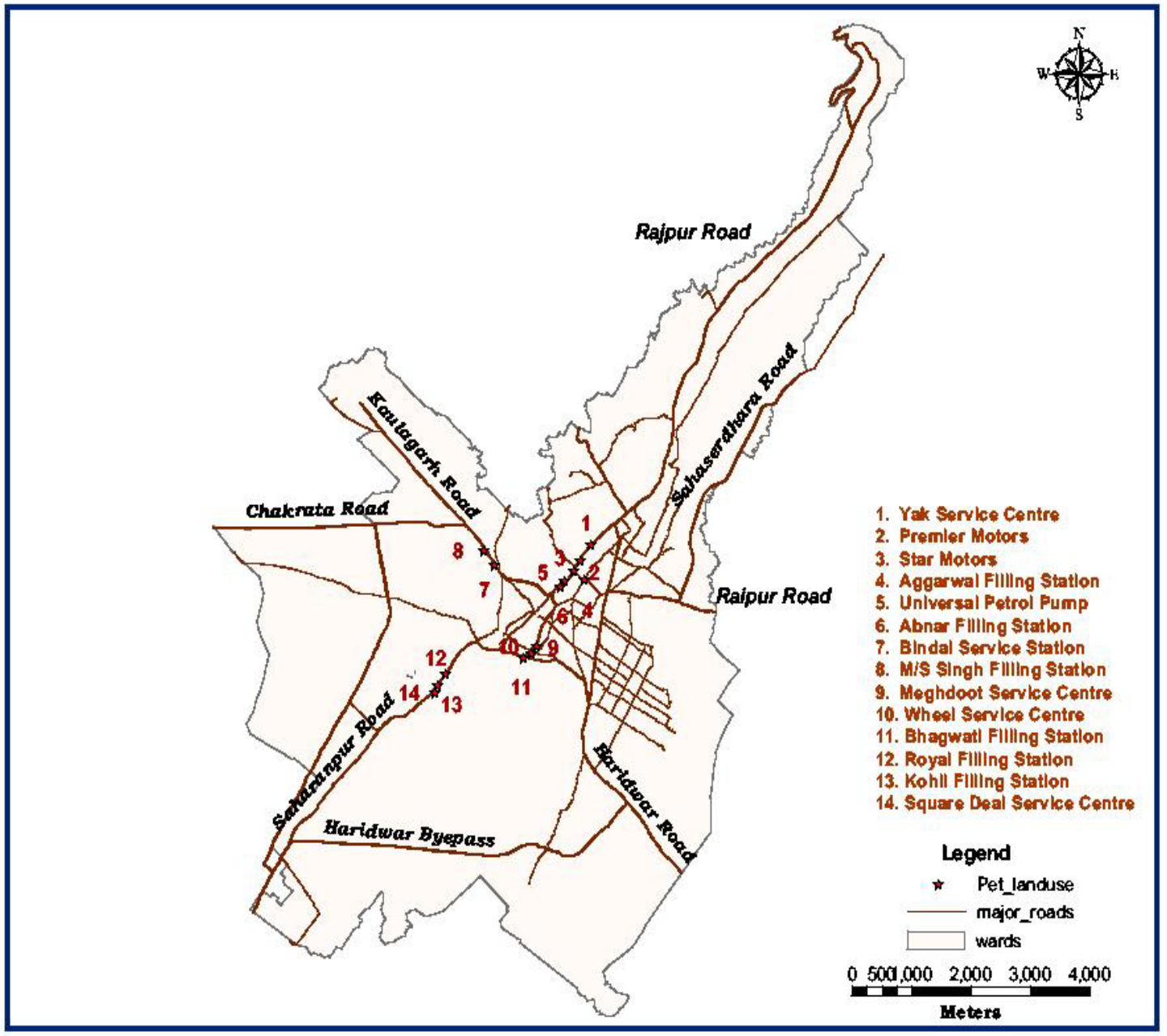
- TAX PAYING
- TAX NOT PAID
- GOVERNMENT LAND
- ROAD

DATA SOURCE : REVENUE RECORD
MARCH, 2001, CMC, W.B.

NEARLY Rs.1 09 000 (4%) REVENUE IS EVADED UNDER 79 PLOTS

Risk due to petrol pumps

LOCATION OF PETROL PUMPS WITHIN DEHRADUN MUNICIPAL AREA



200m BUFFER ZONE AROUND PETROL PUMP

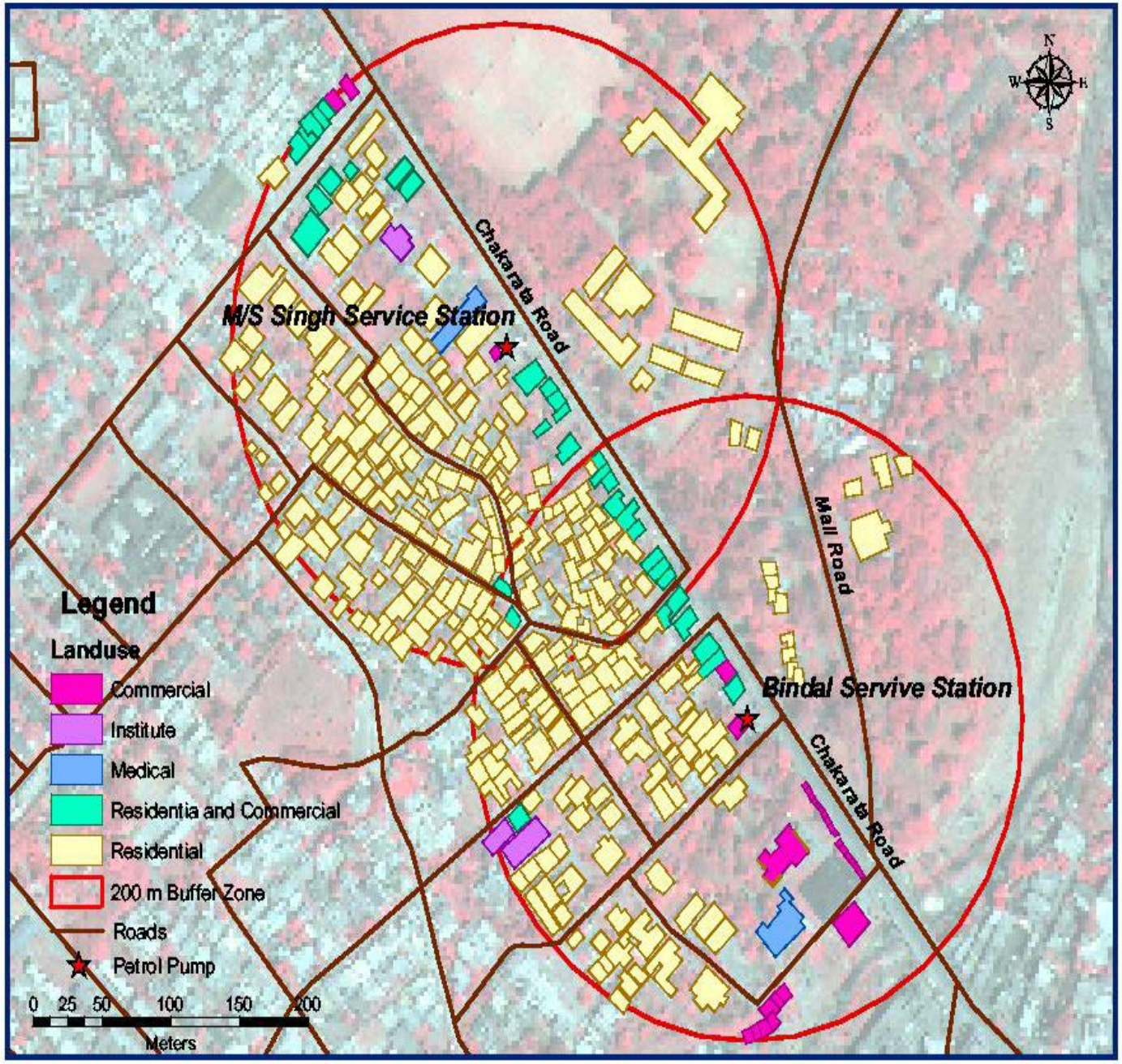
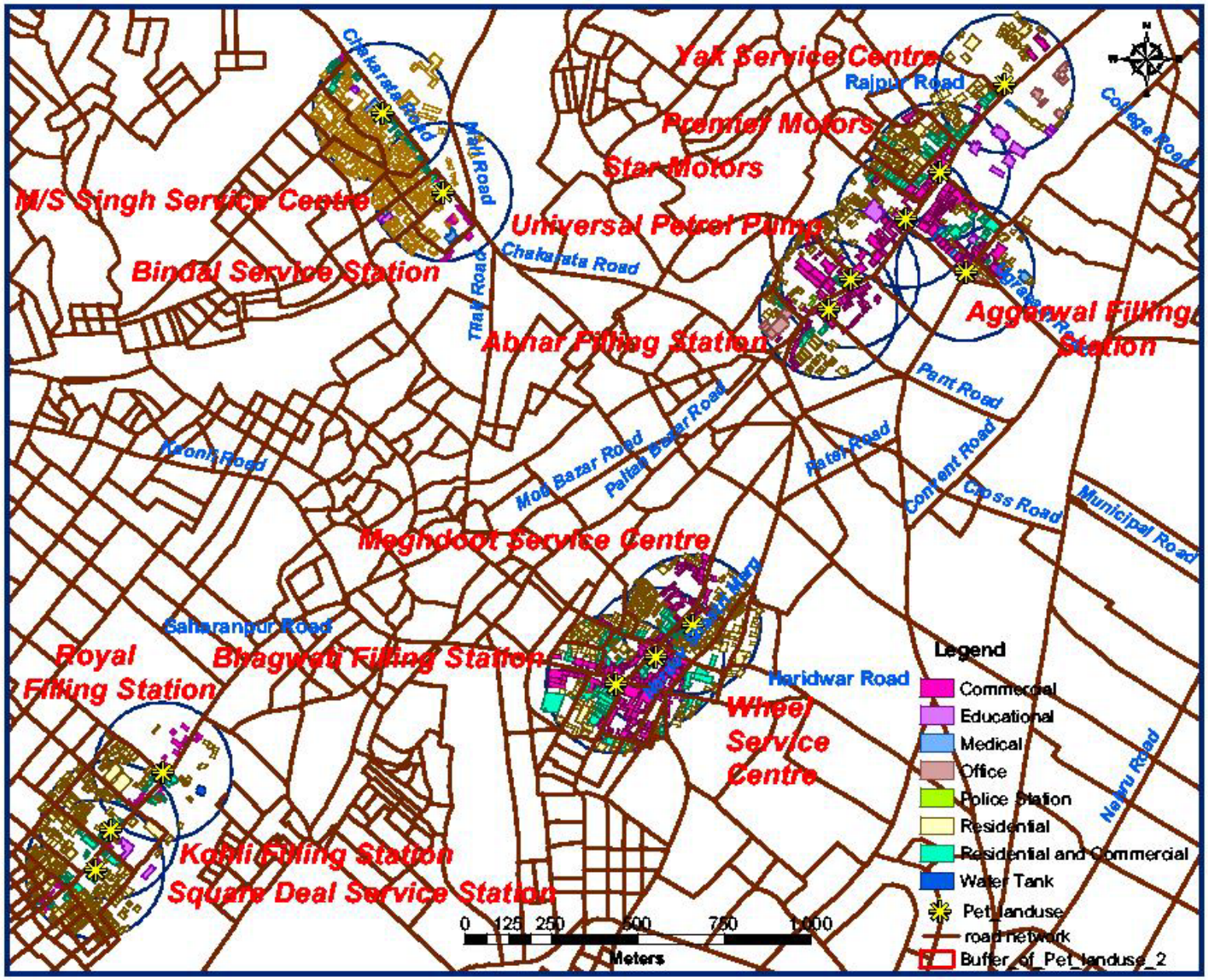


FIG.3: LOCATION OF PETROL PUMPS AND ASSOCIATED BUILDING USE IN 200m BUFFER ZONE



Building Uses Around Different Petrol Stations

1. Yak Service Station

Building Use	No. of Building
Residential + Commercial	14
Commercial	5
Residential	57
Office	5
Police Station	1

2. Premier Motors*

Building Use	No. of Building
Medical	2
Educational	5
Residential	76
Residential + Commercial	45
Commercial	57

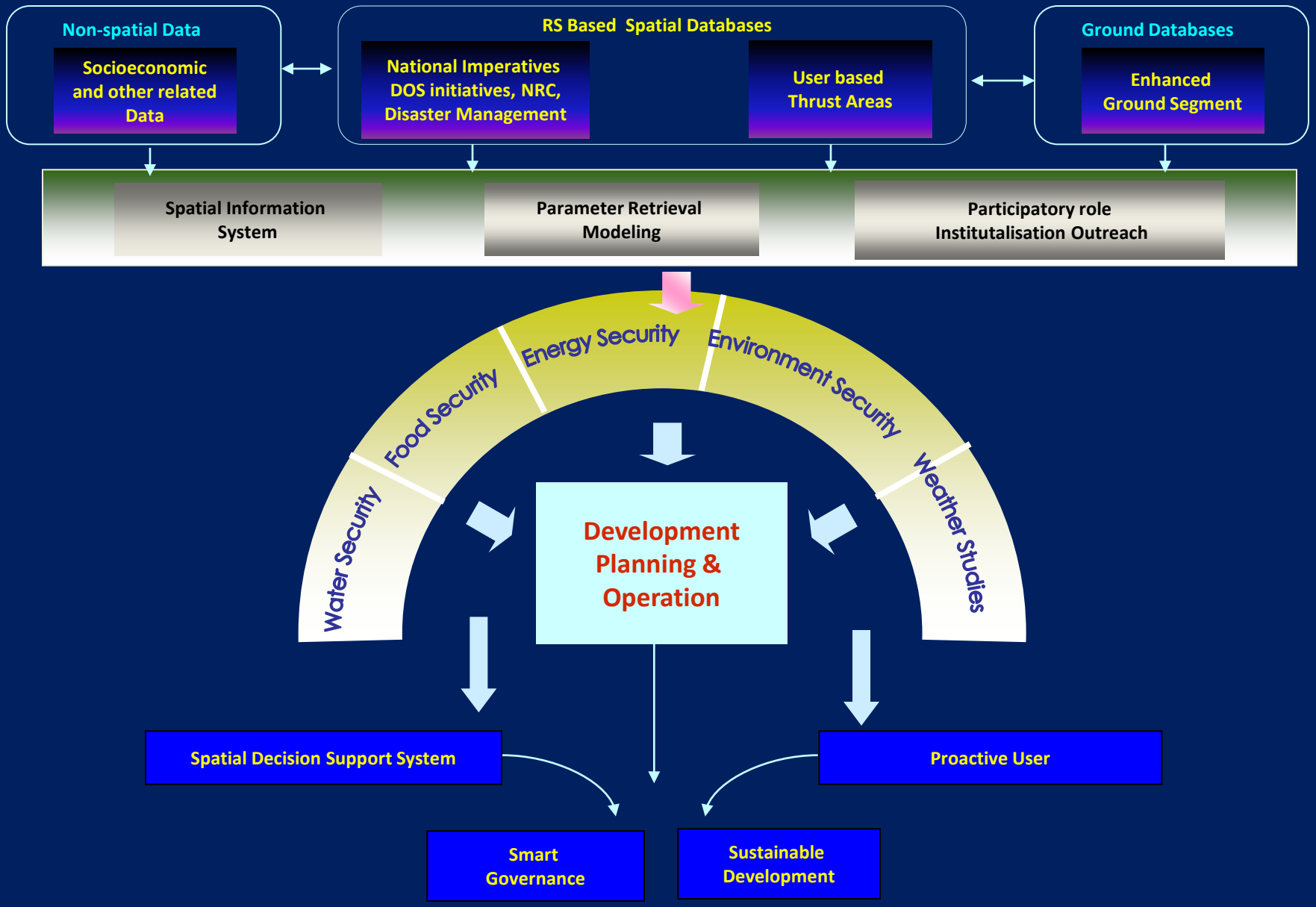
3. Star Motors

Building Use	No. of Building
Medical	2
Educational	1
Residential + Commercial	21
Residential	63
Commercial	71

Criteria taken for assessment of Risk

1. **Building Density**
   a) High (> 15 buildings/hectare)
   b) Moderate (10-14 buildings/hectare)
   c) Low (< 10 buildings/hectare)
2. **Population Density**
   a) High (> 1500 persons)
   b) Moderate (1000-1500 persons)
   c) Low (< 1000 person)
3. **Building Uses**

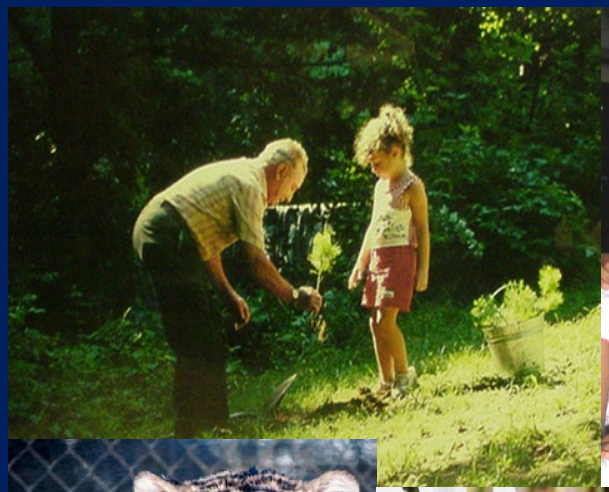
Geo-spatial approach for Development & Planning

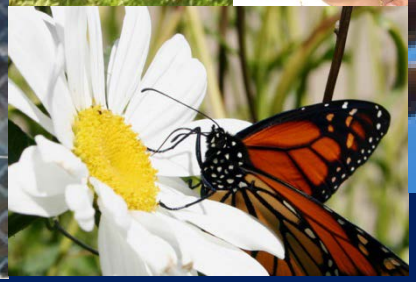


Come... Let us create a better future

We need to participate in

Greater understanding for each other
Shared sense of responsibility
More empathy
Cause and will to act
More collaborative efforts
Stronger leadership





. . . For ourselves and our children

"The Application of GIS is limited only by the imagination of those who use it"
It's In Your Hands . . .